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ABSTRACT

The purpose of this international conference was to analyze and discuss the fundamental aspects of education and training in information work both for specialists and users. This proceedings volume is divided into two parts. Session I concerned the training of information specialists and contains 51 invited and submitted papers. The training of information users was the topic of Session II and has 15 invited and submitted papers. Also included in this volume are conclusions of the conference, three closing addresses, a summary, author index, list of conference attendees addresses, and principal abbreviations used in the text. (SJ)

ED 071680

INTERNATIONAL CONFERENCE ON TRAINING FOR INFORMATION WORK

Rome, 15th-19th November, 1971

ORGANIZED BY THE ITALIAN NATIONAL INFORMATION INSTITUTE UNDER THE SPONSORSHIP OF THE INTERNATIONAL FEDERATION FOR DOCUMENTATION

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CORRIGENDA

P. 327, line 12:	*for* of *read* or
P. 329, line 8:	*for* occupational *read* operational
P. 330, after line 13:	*insert*: Thirty per cent for specific lectures following participants needs
P. 495, line 35, col. 2:	*for* Rome *read* Milan
P. 506, line 11, col. 2:	*for* 40 *read* 409
P. 509	after IFAC *read* International Federation for Automatic control

PRESENTATION

by

RUGGIERO FIRRAO

Chairman of the Organizing Committee
and Vice Chairman of the Istituto Nazionale dell'Informazione

This final, enlarged edition of the conference papers completes our Institute's undertakings in the organization of the International Conference on Training for Information Work which ended in Rome on 19th November last year. It also represents our major effort in bringing the results achieved on that occasion to the knowledge of all those concerned with the problems of information and documentation. But I must emphasize that this certainly does not mean that we consider our task as completed, since it is our firm intention to continue to contribute in every way open to us to the effective achievement of the many vital conclusions reached at this meeting.

We regarded the publishing of the Proceedings *as a duty that we could not evade even if this has brought with it yet more and greater sacrifices than those entailed in the organization of the Conference itself. We have gone ahead with the publication in the firm conviction that the volume will make a qualitative contribution to the solving of the numerous and worrying problems which lie behind the development processes of the new technologies, whose rôle in the sphere of the use of information is constantly increasing in importance.*

With the International Conference the purpose was to tackle, analyse and discuss the fundamental aspects of education and training in information work not only for specialists but also for users.

Obviously the focus was mainly centred on the documentation sector which constitutes, within the sphere of information science, the aspect which we can define as traditional but which still preserves its instrinsic validity also because it is has become an integral part of the new automated systems which are overturning the concepts on which the techniques of documentation have hitherto been founded. It now faces the difficult and important task of adapting successfully to this changing situation.

The training and education of specialists and users therefore represented the main lines of the discussion developed by the invited speakers and the submitted papers and continued by the participants. In this context, naturally, the consideration of the technical aspect could *not prescind from an investigation of a political character, particularly in the light of the unanimous conviction of the need to press for the intervention of governments to ensure a more organic and effective participation on the part of the public administration in the processes of the regulation of information and documentation, whose rôle is no longer predominantly in the scientific and technical fields but extends to much wider areas including the vital social and economic ones.*

Problems of an ethical, and psychological nature therefore flanked the main arguements, to produce a very wide panorama of the current world situation in training in information work.

Information and documentation in industry also provoked a constructive debate on the place that they must take in aiding economic growth and hence on the characteristics that information workers should have in this sphere and the type of training they should receive. While in the context of the public administration the need was stressed for the revision and adaptation of existing structures in order to bring them in line with the exigencies arising from the dynamic function that information has assumed.

The Conclusions which were approved at the end of the Conference demonstrate unequivocally that a minimum common denominator exists as regards the problems of information and documentation in all countries, including those where they have experienced their greatest development.

The ethico-social man/machine problem was widely debated and there was a general and heartening consensus on the need for the effective control of technology to ensure that its immense and costly achievements are really used for the benefit and not to the disadvantage of mankind. The computer, with all its vast implications for good or ill must remain what it most certainly is, a valuable working instrument. But if we are to master information and its modern techniques and exploit them in the interests and well-being of society, we require men of the highest quality for the organization, control and transfer of the ever growing accumulation of data and facts. For this we must train well and early. And the responsibilities here are great, not only for governments but for all those intimately concerned with information work.

In the course of the meeting other problems found their rightful place, rendering the international participation more fruitful and demonstrating the need in education and training in information science for the establishment of a permanent conference, meeting at regular intervals, to survey the situation and the progress made in the field, and to discuss and find solutions for the new and pressing problems that will continue to arise as a result of the transformations that the information sector is undergoing. Such periodic meetings seem all *the more valuable in the light of the importance of establishing as close international collaboration and standardization as possible so that the best use can be made of the great international information networks now projected, first and foremost, UNISIST.*

This volume, we feel, can provide a useful working tool because the papers contained in it, the conclusions reached and the prospects it has opened up preserve, and will continue to do so for some time, their absolute validity and actuality. Indeed, it should stimulate further action directed to stepping up international co-operation which will also embrace the active participation of the developing countries which, as the papers from these areas so vividly demonstrate, feel acutely how important an element information and documentation is for the elimination of economic and social backwardness, and in the training of an executive class fully aware of the administrative and industrial responsibilities that await them.

In presenting the Proceedings *I want once again to give recognition to all those who have so altruistically helped in the realization of the International Conference and the printing of its papers thus enabling our Institute to make a qualitative international contribution to training in information work. In particular, Prof. Helmut Arntz has shown us how valuable collaboration between Governments and specialists in the field, preceded by sound national policies for documentation, can be for a new definition and the progressive development of this sector. A particular word of gratitude must go to Georgette Lubbock who has also edited the present volume, in a spirit that we can define "universal" and which has shown, again in this case, how cooperation between scholars in different countries can give really exceptional results if motivated by a real will to work in the interests of all.*

Rome, September 1972.

INTRODUCTION TO THE FIRST EDITION

The main body of the papers published here are concerned with the practical aspects of training for information work. This concrete approach is in itself positive since it reveals a strong and widespread tendency towards the achievement of a revolution in the scientific field — and not only here — in traditional methods of study and research. On the other hand some authors have made an essential and enlivening contribution by carrying their discussion from the practical onto the philosophical and theoretical plane.

The papers have originated from a satisfactorily wide geographical area. In this context, it has been a motive for satisfaction that the Organizing Committee was kindly offered, and was glad to accept, a group of hitherto unpublished papers, although they had already been discussed at a Symposium on "La formation des documentalistes dans les pays en voie de developpement" held last September at the Ali Bach Hamba Institute in Tunis. The decision to admit these was based on their pertinence to the theme of the Conference and the commitment they reveal.

The editing of the Conference Papers themselves has not been an easy task. The fact that the majority were received well after the deadline posed a formidable number of problems, not least that of translating — since the Conference Papers are published integrally in Italian as well as in English — and that of making the required improvements to the papers submitted by authors whose mother tongue is not English. The time available for publishing limited the extent to which it was possible to get in touch with the authors about their texts. Nevertheless, bearing in mind the time factor, we hope that the end result will be acceptable to the authors and the readers of the Conference Papers.

My thanks go to all those that have helped in this work and, in a particular way, to Mrs. Wallis Ammerman for her unsparing collaboration in the preparation of the papers for the press and proof reading.

Lastly I should like to say that the support that has been forthcoming for the Conference by authors distinguished in their field has been an encouragement to an undertaking which is, in fact, the Italian National Information Institute's first contribution at an international level.

Rome, November 1971

GEORGETTE LUBBOCK

NOTE TO THE PROCEEDINGS

This final edition of the Conference Papers — the Proceedings *— includes some late papers of particular interest and relevance, the Conclusions, a short summary of the discussion and an address list of authors and participants. We also considered that it would be useful to provide the papers with brief abstracts and that it would interest readers if biographical notes on the authors were given. Almost all the authors responded to our request for these and to them our thanks must go. Lastly a list of the main abbreviations found in the text is provided.*

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OPENING ADDRESS

by the Hon.
MARIO ZAGARI,
Minister of Foreign Trade and Chairman of the Istituto Nazionale dell'Informazione-INI

Ladies and Gentlemen,

It is with very great pleasure that I have come here this morning to open your meeting during which the problems of the training of inuformation users and specialists will be considered in depth. I am sure that your work will be profitable and will make a worthwhile contribution to a subject which is now of such actuality. I am equally convinced that this will be an excellent occasion for recalling Italian public opinion to a matter which, in my opinion, undoubtedly has a political implication. What I am raising here once again is, in point, of fact, the problem of informatics. It has been accepted everywhere that the technologies and methodologies arising from it are of outstanding importance for modern countries. They make possible the modernization of administrative structures, services and production. A process of this kind is underway in various countries and even if it creates situations that are at times difficult and delicate, it undoubtedly enables the achievement of a greater level of efficiency and productivity.

But those that are working for such a purpose all too often see their hopes and optimism dashed. Where industry acts in this field of its own initiative and through its commercial capacity things go ahead for better or worse. But in the absence of any real support at governmental level for the dissemination of the new technologies and methodologies progress is inevitaly slow and the benefits much more circumscribed than they might be.

In other countries public bodies — working in direct contact with government organs — have been established for the study of the methods for and stages of the introduction of the new techniques into the public service and the co-ordination of the various initiatives. In this context I should like to refer to the French « Delegation for Informatics » as a result of which France is now very advanced as regards the use of computers in the public administration and the training of the necessary manpower.

Speaking frankly, at present no modern state can hope to achieve the operative quality it requires for its organs if it fails to make proper use of what technology has made indispensable for the improvement of their efficiency. But let us remember that the installation of certain equipment is not in itself sufficient. What is needed is the knowledge of how to get the best out this; something which in many cases implies the complete re-thinking of an organizational process when a computer is installed.

In Italy, however, recognition of this fact is slow to come. We tried over a year ago through a major national meeting to stimulate public and governmental opinion on this problem but without any appreciable results. This was followed by an important Round-Table Meeting organized by the Giovanni Agnelli Foundation at the end of last year — again this produced nothing more than the setting-up of a committee or two! Such indifference seems entirely unjustifiable. We cannot secure any of the hoped for and possible advantages from these new instruments at any level if there is no public organism capable of guiding enterprises, preventing unplanned and uneconomic proliferation and training the requisite manpower.

I have already expressed these concepts in Parliament and at the C.I.P.E. (Inter-ministerial Committee for Economic Planning). But I am bringing them up again here because I am convinced that we must loose no opportunity for emphasising the price that is and will be paid for certain inertia. There is an urgent need to set up an appropriate organism, coming immediately under the Presidency of the Council of Ministers or the Minister for Scientific and technological research.

The following figures give food for thought. According to a reliable estimate the stage of economic development now reached by the country in fact makes possible the use of about 15 thousand computers, and 135 thousand computer experts and 100 thousand technicians to man them. Our present stock of machines is, on the contrary, less than 4 thousand and the operators do not exceed ten thousand. As you can see the gap is immense. Studies carried out by « Associazione Italiana per il Calcolo Automatico » show that at the end of the present decade we shall need 150-200 thousand specialists and 20,000 machines. If we are to obtain such a number of specialists we should currently be training about 12 thousand persons a year. We are a very long way from achieving this. In these conditions it should be no cause for surprise if the computers, according to reliable assessments — are being used at 30-40% below capacity.

Clearly such a precarious situation cannot be allowed to deteriorate yet further; the ensuing damage to the country would be incalculably grave. It is often all too easily forgotten that we are working in a wide international context and that we cannot permit ourselves the luxury of excessive neglect. If the productivity of our economic system fails to improve in parallel with what is taking place beyond our frontiers our chances of growth are slim indeed.

Strange to say, in Italy, the recognition that a new technological achievement is a multiplication factor for the country's wealth tends to be regarded as an exaggeration. Whereas in all the other industrial countries the development of science and technology is considered to be a strategic element in economic growth, such efforts here are a faint echo of what they ought to be. Certainly we cannot hope to bring a research and scientific policy to fruition if we persist in ignoring such a fundamental factor of modern history. At times it even seems that there is a determination not to recognize that the world is tending to become organized in great regional systems, linked to one another by ever increasing trade channels. We can no longer evade this evolutionary process which causes our economy to become increasingly integrated in the economies of other more developed regions and in those that have recently appeared on the world scene. Such a dynamic evolution no longer allows us to go our own way but compels us to learn through the experience of others the lessons that will enable us to participate appropriately in the general progress. It would be a tragic error to think that we can perform any kind of rôle at all in the international context if we stand still and turn a deaf ear to all the warnings, while others forge ahead. This can only mean that the country will jeopardize its survival as a culturally and politically significant entity.

I am also bound to observe that seen from the European angle the problem appears to be badly centred. Even if it is admitted on all sides that a common effort is essential, in fact it seems impossible to launch even a minimum programme for the co-ordination of activities. Everyone goes his own way with the certain result that very soon we shall reap the inevitable bad harvest. We can only hope that the future will hold less bitter surprises for us than in the past.

In recent times we have frequently witnessed a happy expression used by an author being taken up on all sides and becoming a catchward which for a time polarizes public attention. One that now recurs very frequently on both sides of the Atlantic — and is even used by scientists when they want to express one of the most typical aspects of our times — is the « information explosion » understood in the sense that in our day not only has there been an overwhelming increase in the sources of information but also in existing information and its world dissemination.

Information explodes: in this context it is sufficient to quote some data produced by two chemical research workers at Oxford. They estimate that last year more than 275 thousand reports were published in the periodical press, 25 thousand more than the previous year, marking an annual growth rate of about 10%. Such a rate of increase is neither fortuitous nor unique to this branch of science. According to these two researchers if the other scientific and technological sectors are taken into consideration it is very probable that next year over a million studies will be published and in ten years the ten million mark will have been reached.

These figures speak for themselves. A characteristic of our times is the vast technological and scientific output which constitutes a source of explosive information. A scientist who has devoted much attention to this question — Derek de Solla Price — has ascertained that whereas in the past a similar growth law has been respected, we have now reached « explosion » figures. This is no less true for other types of information, hence the prospect before us is far from reassuring. Obviously an increase in the world's knowledge does not mean that it automatically becomes the cultural property of the community. Nevertheless the structures of a modern society do tend to enable the citizen to get at the essential part of this knowledge. In effect the process of mass education underway in all the most advanced countries arises from this strategic decision.

Information has to be circulated. There is a constantly growing demand for educated, well-informed men, since the models of affluent societies can be achieved only on the condition that we can count on a supply of excellently educated and technically updated people. This factor brings us face to face with a complex of vital problems: how is this flow of new knowledge to be organized, how is it to be processed, disseminated and controlled? Certainly anyone aware of the problems of political democracy is well acquainted with one important aspect: that is to say, how are we to ensure that the information boom holds no trap for us? There is an undeniable risk that those controlling the channels of information might organize it to secure and use power oppressively. At this point the complexity of the background to the conference theme, also at the political level, becomes extremely clear. Very dangerous tension can arise within a rapidly changing society due to unbalanced and erratic circulation of information. Indeed the possibility itself of reforming the fundamental structures depends to a great extent on a secure knowledge of certain technologies and of the rules of societal behaviour. This calls for an experimental attitude on the part of those whose responsibility it is to guide this innovation and constant attention to the data and the knowledge that help to prevent or reduce operational errors.

This serves to emphasize the extremely delicate nature of the entire process of the control of the circuit of information from its source to its utilization and of the training of users and experts. The most difficult aspect at the present time is shown to be that of the circulation of information. If this is to be effective it is essential to ensure that the right information, at the right time and in an appropriate measure reaches the persons that need to use it.

Although conceptually the problem presents no very great difficulties, the hurdles to overcome in order to translate it into concrete terms are stiff indeed. The vertiginous growth of news and knowledge of human interest merely multiplies the difficulties. To this must be added the fact that man has only relatively recently become aware of the problem, its increasing gravity and the difficulty of finding adequate solutions for it. Fortunately a start has been made in recent years and the fact that the International Federation for Documentation is present here in Italy for the fifth time is a sign that things are moving, albeit it slowly.

Neither is it difficult to understand that it is to the general interest that the phenomenon be suitably regulated. Consider, for instance, productive activities. The rate at which industry renews its technological potential, under pressure from the incessant production of new technologies, interpenetration on the world markets and the consequent commercial competition is well known. Agriculture for example is on the threshold of profound change which in some five years time could bring about a vertiginous increase in the technical and scientific content of its products and the processes by which they are obtained. « The green revolution »» about which we have heard so much recently, has its origins in an immense amount of laboratory work and agriculture is being impelled to use very advanced methods of cultivation.

It is perhaps a truism to say that innovation rarely arises in those industrial or agricultural firms that would benefit from exploiting it. Much more often it is the result of work carried out in the research laboratories of the universities or public experimental stations. Thus there arises the problem of transferring the information from the laboratory to the potential user who may well be in a different country from that of the research centre. To transfer information quickly but accurately is, as we all know, an extremely difficult matter. These masses of new facts produce a phenomenon very similar to that which road traffic generates, as you will probably have had reason to observe in a city such as Rome — a series of blockages verging on total paralysis. How essential it is in such a case, to put into action a system for the control of the traffic can all too easily be appreciated from the chaos we are facing. Similarly in the absence of a system for the control and processing of informaton, in the long term, industry will be forced to give place to those that have been more skilful in accessing the sources. The strategy of productive expansion itself — now almost a revealed truth in industrialized countries — favours these that are readiest to seize the opportunities offered by a new manufacturing process, a new technology or a new organizational and commercial methodology. And if we turn to a consideration of what is happening within the public structures, it can be seen in this case that the good use of information is a primordial condition for all social progress. I mentioned a short time ago the phenomenon of mass education. You are all aware of the desperate search for the ways and means of evolving educational techniques that are really capable of solving this problem. To ensure that the young who are « born on the wrong side of the railroad » — as a famous American writer wrote rather bitterly — are given the chance to attain a high cultural level will depend not only on the political will of the holders of power, but also on the availability of techniques which reduce to reasonable proportions the costs of achieving such an objective. Now since techniques are evolving rapidly, it is extremely important that an information system is set up through which people may learn what others have ventured upon and what they have achieved.

If we consider the intensity of the development of the transport system and its rapid technological evolution we find the same exigency. And such is the case if we look at updated health service systems, the organization of free time and the efficient networks of mass telecommunications. Again in the case of the preservation of the environment and its defence against the innumerable sources of pollution damage by natural agents, the need for the efficient use of information appears vital.

The very services in support of power — statistical, fiscal, econometric, judicial — render such a need acute as well as the good government of that extremely important instrument which is mass communication. Without a good flow of information the relationship between the state and the citizen will never be well regulated. At this point we touch upon one of the most delicate subjects of community life. Many people consider that today the very method of policy making itself ought, as a result of the affirmation of the new communication technologies, undergo profound alterations.

Thus we have seen that the problems of information involve the economist as much as the industrialist, the educator as much as the politician, the administrator, the health service official, the researcher, the technician, the agriculturalist and the jurist. It is important that all these people are able to get at the most up-to-date data in their fields as quickly and as effortlessly as possible. Behind this, however, someone must be responsible for defining and keeping the system going. And this requires the collection and selection of data, their reduction to suitably brief but nevertheless sufficiently clear messages, their storage and transmission to where they are needed, thus enabling he who requires the information to locate it easily, re-process it and pass it on in his turn.

The realization of such a system obviously needs the services of a group of specialists in different fields and, on the other hand, its use requires that the user shall have a knowledge of the working techniques and the principal concepts on which the system is constructed.

Historically it was the scientists who stated the problem and attempted to find the first partial solutions for it. The very nature of research requires that a researcher is equipped with accurate and complete knowledge of the work done in his field. This has led to the publication of work in increasingly narrow fields of research. This system very soon showed itself to be insufficient; it has created a sort of barrier between those working in neighbouring sectors and has placed a heavy work load on those concerned with inter-disciplinary problems. Moreover this line of development has caused the multiplication of scientific texts and increased the confusion. As a result researchers of the same « family » have tended to increase the number of study meetings they hold in order to communicate verbally the results they have achieved. The result is a step back: they have returned to oral communication. In other cases, though, having turned to the computer for the solution of their research problems, they made it the key instrument in their documentaton system. And they have had success.

Industry quickly followed this example. As everyone knows, production activities depend on a critical variable for their success: that what is launched on the market does not arrive there too late or when an alternative product is already present. This calls for a series of strategic decisions within a firm (and sometimes even without) which must be made well ahead of the launching of the product. It also requires efficient planning and internal organization. An industry cannot act in the dark, that is to say, without that store of information which enables the necessary decisions to be taken at the right moment without too great a margin of error.

We can perceive, at this point, how once that it has been proved that the computer and its subsidiary apparatus make it possible to set up efficient information systems, albeit in particular sectors, contagion with others becomes inevitable. In the world in which we live we are witnessing an integration of technologies and experiences which is certainly very useful to humanity since it speeds up general progress. It must, however, be observed that the phenomenon often provokes tensions within societies because of the slow process of adaptation to innovation on the part of men and their institutions.

In the matter with which we are concerned we are witnessing the appearance of the information technician alongside the classical documentalist. He who yesterday was prepared to organize libraries, archives and certain editorial activities, today needs the helping hand of a technician. If yesterday experience in book classification, abstracting and the codification of information was sufficient, today this is no longer so; now it is essential to know how to use electronic techniques, to understand programming systems and data storage, to be familiar with data files, with the plethora of input and output terminals. Hence the new information expert is forced to live alongside the communications engineer, the lingustic expert, the logician the audio-visual technician and the programmer. From such an encounter it is obvious that there will develop a new type of information professional, a specialist, who will be all the more necessary the more the patrimony of human knowledge increases.

At the moment, however, we are groping our way. It is not yet entirely clear whether the specialist needs to know the matter which he must process. Let us take an example: if an information expert works in a sociological and physics institute it would be necessary to ascertain what part of the fundamentals of both disciplines he ought to understand. The problem — currently unsolved — is very far from trivial given that on its solution will depend the capacity of the information specialist to adapt to various types of work.

Although problems of this sort require an answer, there can be no doubt that it is urgently necessary that classical documentalists should come to terms with the new techniques, leaving to research groups the task of studying in depth the areas still insufficiently explored. In this respect notable progress has been made in some countries. In the USSR, for example, it appears that some tens of thousands of persons have been updated in the new techniques. In other countries, although industrially advanced, virtually nothing has been done, or the first steps are being taken, as is the case with Italy.

It is certain that periodical meetings like ours and the exchange of experiences will produce more valid ideas. Understandably a system which requires the collection, codificaton, analysis, transmission and processing of information is costly, at times extremely so. Hence it is essential to explore the alternative methods of realizing a system and estimating its potential and cost.

Education is a no less actual problem than research and experimentation. Many specialists are wanted and it is essential to define how they are to be trained. We ask ourselves whether the current training system, even if opportunely adapted, is capable of meeting the demand. At university level it is possible to attempt to introduce new degree courses or specialization courses or to integrate the information courses that have been instituted in certain countries in recent years. But it is also being widely remarked that a certain amount of teaching in this field should be imparted at secondary school level. And the teachers, how are they going to be trained? And where? And who should be responsible for updating them?

These are questions for which a convincing answer is still awaited. Obviously the possible answers are many and are dictated by the educational structures and traditions of the various countries. Nevertheless it is beyond doubt that we are facing a general problem which, for its very nature, has no geographical limitations. A judgment of this kind has, for example, been made in the UNISIST programme according to which it is now time for the nations to make a concerted effort to find the most adequate solutions. In every continent the problem is acute, even if, at times, it appears under different forms. However, it is my conviction that we are all, in fact, interested in this problem upon which depends to such a great extent the degree of mutual knowledge of the various races: the third world no less than the industrialized regions. I know that the developing countries complain of a great void in this sector, as they themselves recognized at the regional meeting held in Tunisia.

This confirms me in my convction that the solutions to the information problem must be sought in an international light, without over indulging in the egoistic temptations which in the past made some industrialized countries into colonial powers. The history of recent times has provided many useful lessons. It is as well to remember, in this respect, that it is to no one's interest to create the germs of new tensions between races.

The level of the development of information technologies and systems in fact varies considerably from one industrial country to another. Hence there is everything to recommend the achievement of a certain degree of uniformity in order that the process itself of the circulation of information beyond frontiers is facilitated and intensified. It is well known, among other things, that certain information, codification and processing agreements ought to be negotiated at international level.

I know that you are about to debate some overdue questions: how ought the teachers be trained, how should the text books be designed, how should the specialist courses be introduced at the various educational levels and so on. I myself have already referred to some of them. I know that you are bringing a non partisan spirit to your debate and this convinces me that our work here will produce really worthwhile results. For my part I hope that this gathering, here in Rome, will provoke a lively interest in Italy for this problem. If this occurs, the conference will have helped to bring this problem to maturity, as is the hope of the Italian National Information Institute which has undertaken the task of organizing it.

Gentlemen, undoubtedly to dominate and increase the circulation of information will constitute the keystone for the future. Recognition of this induced the last conference of science ministers to call for the setting up, in the various countries, of national documentation centres.

There is a logic in all of this. At the political level all the dramas and the problems of the life of a community converge and develop in their real and at times tragic dimension. Those that are called on to find solutions must be able to know, with sufficient reliability, the causes and the possible solutions. They must be able to estimate the cost and the long term effects that could arise. Only on these conditions will it be possible to administer power wisely, modernly and fairly, in times in which the activities of a state are becoming infinitely more complex and are having an immediate impact on the future of everyone.

Conscious as I am that you are well aware of the profound implications of your activities, I should like to wish you all possible success in your work.

SESSION I

Training of Information Specialists

INVITED PAPERS

EDUCATIONAL AND TRAINING ISSUES IN UNISIST

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This paper is presented in two parts, the first part dealing with the educational requirements of a world science information system (UNISIST) and the second with the proposed action and recommendations concerning training and education in the field of scientific information.

In Part I the educational requirements of information scientists, information specialists, scientists, (information users) and editors and publishers are outlined. With the growing sophistication of the organization, methods and techniques of information transfer, these groups must extend their educational programmes or introduce new ones if they are to participate effectively in and profit from a world science information system.

Of the 22 Recommendations of the UNISIST Study Report, Recomm. 12 concerning the contribution of professional societies to training and manpower issues and Recomm. 13 concerning manpower development, are taken as the basis for the proposed action and recommendations concerning training and education dealt with in Part II of this paper. The specific aspects/topics discussed are teaching methods, techniques, curricula and educational management.

A very important part of the UNISIST Study Report[1] is devoted to educational issues, both in the requirements for the establishment of UNISIST and in the solutions and recommendations for its implementation.

Training and education in scientific information as presented in the UNISIST Report are pertinent to two factors: one, the existing general trends in teaching and training of scientists and engineers, and two, the professional requirements of scientific information concerning information control, processing and use; and also the design and operation of information systems and their components.

The presentation of educational issues in the UNISIST Study is general, due to the multi-functional character of the project which must reflect all possible aspects of scientific information related to the feasibility of the world science information system Therefore, the considerations and proposed solutions are rather indicative and do not deal with concrete structures of scientific information education which will be chiefly determined by the general situation in each individual country, and particularly by the prevalent state of industrial development, economic resources and the needs of the specialists.

In this paper, I should like to describe and comment upon the educational and training issues which form one of the programme objectives of UNISIST (III). The Report states that « UNISIST should work to develop the human resources essential to the planning and operation of a future information network ».

My observations on this important subject will be presented in two parts:

1. The educational requirements of the world information system;
2. Proposed action and recommendations concerning training and education.

A preliminary foreword is needed. The UNISIST Study will be submitted to the participants of the Intergovernmental Conference which will take place in Paris in October 1971 to discuss the proposed recommendations, but as this paper was written in August, it is evident that it cannot take into consideration the results of the Conference.

I. *Educational Requirements.*

The educational requirements in scientific information relate to several professional groups, namely:

a. documentalists;
b. scientists (information users);
c. editors and publishers.

a. *Documentalists*

Information work, as described in an ASLIB booklet[2] offers a stimulating and demanding career to graduates with lively minds. It brings them into contact with all kinds of people, including those at the heart of the struggle to increase man's knowledge and powers. It demands and develops a knowledge of a wide range of subjects and at the same time gives the documentalist the satisfaction of establishing himself as an authority on the literature of the subject, or subjects, in which he specializes. It is also a field in which exciting new developments may be expected. Advances in electronics have opened up the possibility of applying automation to certain aspects of information work, notably to the preparation of indexes in much finer detail; this is involving a rethinking of many traditional disciplines such as classification.

These conditions of work determine in a certain sense the professional background of the documentalists and determine also the educational and training requirements.

Generally speaking, « documentalists » can be divided in two broad categories: *information specialists* (information officers, or science information specialists) and *information scientists.*

The *information specialist* is a service-oriented person, as against a research and development person. Existing practice shows that the information specialist can have a position at any of the different stages of information processing, such as: collecting, indexing, retrieval, etc. In this profession, each position requires the incumbent to have, in addition to the subject knowledge, at least one of the following qualifications:

a. professional library education and experience;
b. administrative ability and experience;
c. knowledge of non-traditional information systems and instrumentation;
d. foreign language proficiency.

What needs to be stressed is the scope of this profession, the intellectual stimulus, and the variety of opportunities it affords men and women for using their training, knowledge and imagination. At every step of the information process there is a need for evaluation of the information and at the last step an opportunity to interpret materials to facilitate their use[3].

The *information scientist* should at least have a B. Sc. or better, a Ph. D. in engineering or in science. Besides a knowledge of library sciences, which covers classification, indexing, subject analysis and equipment, he should have qualifications in linguistics, human engineering, mathematics, logic, systems design and communication sciences[4]. His work relates rather to the design of information systems and its development, than to the more specific tasks of scientific information processing.

In the UNISIST Report the educational requirements are concentrated mainly on the group of information specialists.

The future of science information is, to a large extent, conditioned by the responsibility of the profession in a changing environment. The word « profession » may seem unclear: the reason is that many different categories are involved in the process, all of which have to adjust to new requirements and to new ways of meeting them, intellectual, technical and organizational. One such category is the user community itself. The frontier between *scientists and documentalists* has been somewhat shifted by the necessary involvement of each in functions that were previously left more or less to the other: abstracting, indexing, building-up classifications and thesauri, providing evaluated reviews and state-of-the-art reports, deciding on the information value or obsolescence of documents. The implication is that *scientists,* or at least some of them, should now receive a certain amount of training in the techniques of information transfer, so that they may co-operate with documentalists in expediting any of the above tasks. Conversely, the functions of *documentalists* are to be revised in two respects: firstly, a deeper knowledge and understanding of the language and findings of science is required in order to be able to accomplish intelligently even the more primitive kinds of subject cataloguing and document indexing in any special field; secondly, a new proficiency is needed in disciplines such as linguistics, mathematics and the computing sciences, in so far as they are contributing to the evolution of more sophisticated methods of information analysis and retrieval. The technicalities of the profession have become such that it may soon be necessary to split into a number of separate branches, e. g. natural processing, file organization and maintenance, etc...

So far, few countries, even among the « major » ones, have developed adequate education programmes to meet this challenge. Those which have, naturally enough, are also those in which the present state of information science is most advanced; the process thus tends to be cumulative, and differences in the know-how increase as experimentation with new information techniques in turn provides opportunities for training users and processors in the most practical fashion. This phenomenon is all too well-known: it is nothing but the « natural » cause of differences in economic and industrial development in a world of unevenly distributed resources. The information transfer field is no exception, but the educational disparities observed in this section have an added effect on the access to knowledge in others. The long term consequences of retardation in information science are therefore enormous. Yet there is no evidence that this trivial fact has been recognized by the education and science planners in all nations.

It is essential that all parties to the operation of cross-national information systems be intellectually self-supporting, that is, they must be capable of managing and improving a fully-fledged sub-system at the overall standard, without having to depend upon external assistance or to reduce the scope of their contribution for lack of skilled personnel. If this is an accepted goal, then there is no alternative but to develop, through the co-operation of all nations concerned, a minimum education programme, to be administrereed on a regional basis, for the training of research and practising specialists in all branches of information science.

b. *Scientists* (*Information users*)

The second professional group to which the educational requirements in the UNISIST Report are addressed is scientists as information producers and users. The fact that scientists produce and use information determines two kinds of educational requirements: at the level of the preparation of scientific information, and at the level of its use. All scientists are obliged to find, evaluate and synthesize information, but the relative importance of information techniques to the scientist depends on: *a.* the concentration of the scientist's time in laboratories, literature or field work; *b.* the theoretical or applied nature of the scientist's work: *c.* the scope of his scientific interest; *d.* the competition for information; *e.* the adaptability of the information facility and its staff to the needs of scientists; *f.* the recorded form, language and security restrictions used by other scientists working in his discipline.

To expect scientists to do much of their own literature searching is normal, but this expectation should not be accompanied by complacency. The scientist has his own concept of what he wants and he often lacks confidence in the information specialist's intuitive grasp of the subject. The information specialist must earn his spurs, but his way will be made easier if the scientist and the engineer accept him as a member of the team on a basis of equality. The scientist, in turn, will learn more about information handling and will gain a valuable follow-up on leads that he himself has no time to pursue[5].

As the costs of information transfer are rising faster than ever before, due to the increasing dependence upon expensive technology, it becomes all the more urgent to find or develop ways of saving money in the overall design of the process. This, first of all, requires the involvement of scientists in information work.

At the very earliest stage in the relay of information authors could play a part in alleviating the burden of information handling, through better writing, preparation of abstracts, assignment of subject headings, etc. Several years ago, in 1963, one of the major findings of the Weinberg Report in the USA was that « authors must accept more responsibility for information retrieval »; many scientific unions and documentation organizations have since made similar recommendations in presenting style manuals, handbooks for authors, guides for the preparation of abstracts, instructions to editors, etc. Despite so much concerted exhortation progress in this direction has been slow: less than half of the existing primary journals demand the inclusion of an abstract as a condition of publication and the proportion of author abstracts in some of the major secondary journals is still distressingly low. In the same way, only a small percentage of primary journals make a point of forwarding abstracts to the proper abstracting services. As for deep indexing by authors or editors, it is still at the experimental phase rather than a current practice.

The involvement of scientists in information matters is an indispensable complement to the specialization of documentalists in science information.

In this part, I have first retraced how scientists should be more involved in information handling, then how authors can help to meet the information requirements of potential users; then the emphasis was on turning users into information officers of the highest grade, for the preparation of critical reviews. This cycle of analysis and synthesis involves scientists, not documentalists; and the question arises of redefining the relations between the two professions. A redistribution of tasks will have to be provided for, with scientists taking on the more content-oriented tasks of document and data analysis, as above, and documentalists, archivists, librarians, etc... adjusting to the new technicalities of information transfer, in so far as they do not call for a deep understanding of document content and significance. Education programmes are needed for both groups.

c. *Editors and publishers*

Other professional groups are concerned by the changes being implemented in the patterns of information handling. Editors and publishers of scientific journals are necessary partners for bringing about improvements in journal presentation and circulation. The interaction between information specialists and scientists in general would be made easier by the setting up or strengthening of regional and/or sectional associations of editors, through which improvements could more easily be discussed, enforced and adjusted than by a multiplicity of local unrelated arrangements. Concerted reflection and action could thus develop matters of common concern to publishers, journal editors, and information specialists: not only format or type standards, but also the involvement of authors in abstracting and indexing, the part to be played by editorial supervision, co-operative schemes for sharing the costs of data input, or expediting advanced material through improved communication media, etc... Standing issues such as the possible revision of the goals and principles of primary documentation would also best be discussed with publishers; other open problems, at this high level, are the case for new forms of repositories in which unpublished data compilations could be stored, the revision of current practice in depository systems (*dépôt légal*) and the harmonization of pricing policies.

The development of editors' associations would and has already provided a useful channel through which matters of common concern are discussed. Not only the members of already existing associations but also participants of the preparatory meetings for future associations recognize the following points as their main common problems, which could be also treated as requirements for future educational and training programmes:

1. *Presentation of articles and journals*

The technique of writing a journal article is bound up with the principles of experimental design and scientific method and deserves an important place in a scientist's education. Future revision of existing style manuals might include writing as well as training in journal management.

2. *New methods*

Continuing effort is to be made towards evaluating and implementing new methods that may increase the overall effectiveness of primary and secondary publications, e. g. advance procurement of references; dissemination of current titles, joint support of special depositories, co-operative agreements for exchanging abstracts in one or several languages, etc.

3. *New forms of publications*

Complementary or alternative forms of document presentation and distribution can be subjects of training, e. g. « letter journals »; « limited scope journals »; for specific and unspecified subscribers; other documents in a different form (microfiches); etc.. The rapid development of computer technology permits the adoption of new techniques intended ultimately to reduce the costs of publications to individual users, e. g. new printing devices, computer-assisted composition, schemes for sharing the burden of data input, etc. Individual publishers are not always in a position to acquire relevant information on current progress, even less to take single-handed actions along any of the lines suggested above.

So there are good reasons for having an international programme for the training of editors, especially for an exchange of experience in the above-mentioned matters.

II. *Proposed actions and recommendations.*

The results of the UNISIST study have been formulated in twenty-two recommendations dealing with several items which are necessary for the establishment and development for a world wide international programme of co-operation in scientific information.

One group of these recommendations is directed towards human resources in scientific information activities. This concerns also the educational and training issues of information specialists and users. Recommendation Number 13 is specially allied to these matters; it reads as follows:

> *Recommendation 13* — For all nations to take active share in the operation of international information systems, a concerted effort is needed to provide information specialists, librarians and documentalists with improved educational facilities; UNISIST should

encourage competent professional organizations such as IFLA, FID, IFIP, and others, to organize this effort with the co-operation of the scientific unions as representatives of producers and users of information — as well as governmental bodies. Attention should be given to the desirability and feasibility of internationally-oriented training and educational assistance programmes, which might include proposals for pooling resources, where needed, in a number of regional education centres.

The educational requirements of a world science information system, summarized in the first part of this paper, concern scientists on the one hand, in their capacity as agents in the switching process, and information specialists on the other, including librarian analysts, reprographists, etc. Appropriate measures have already been taken in some countries to provide or up-date education programmes in information science at university level. This, however, is by no means a general course in all parts of the world: many countries, even among the more developed, suffer from a serious lack of trained personnel to set up or handle modern information systems; and yet, they seem to shun the underlying educational issue. Such disparities cannot but endanger the success of a world-wide information sharing system, as envisaged in UNISIST; it need not be demonstrated that the very principle of sharing between several parties, the operation of an international information system (rather than only the use of products and services provided by a few of them) implies that each participant has reached a minimum level of understanding and performance for all stages of the process (document analysis, information and data input, processing and communication techniques, etc.).

The « participants », ultimately, are the producers and users of information, namely the scientists themselves, as well as the librarians, documentalists, engineers, etc. who take part in the transfer chain, from producers to users. The training requirements of the former group have been mentioned in the preceding section; they ought to be further specified, together with the programmes which would seem best suited to meet them, taking into account the diversity of national practices and resources in education; international organizations such as FID which have recently gained some experience in this area, could be entrusted with further studies to that effect, in collaboration with ICSU, WFEO, etc.

As for the second group — information specialists in the broad sense — educational programmes now exist by the dozen, as shown by recent inventories conducted on a national or international basis. Their diversity reflects in part the legitimate bias of particular institutions toward different facets of information handling, according to local skills or requirements. For this reason, world-wide standardization is not a desirable goal. Nevertheless as mentioned earlier, the level of proficiency observed in some parts of the world — both developing and developed — can be shown impartially to remain below the requirements of information processing in a modern sense, either from a qualitative viewpoint (inadequate programmes), or quantitative (insufficient number of skilled personnel), or both. A few practical steps could be taken with the support of UNISIST to bring about a more even distribution of trained information experts, at different levels of proficiency - e. g. *a.* devising alternative educational programmes on the basis of existing curricula in the more advanced countries, to provide librarians and documentalists with graded bodies of knowledge consonant with the operational requirements of multi-national and multi-lingual networks, while mindful of regional limitations in resources; the co-operation of international organizations such as FID would again be helpful in this context, especially in view of its experience with training programmes in developing as well as developed countries; *b.* promoting the preparation of handbooks and other curriculum material for the different grades (including on-the-job training, continuing education courses, etc.), in as many language as may seem fit to ensure world-wide effectiveness; the use of computer-assisted instruction in the art of information retrieval could be included among the topics which deserve attention in this connexion, as a potential answer to the shortage of skilled teachers, and also as a means to familiarize librarians and documentalists with the more sophisticated information techniques (on-line processing, conversational computers, etc.), *c.* a reinforcement of international professional associations that ought ultimately to take the responsibility for much of the effort advocated in this section (FID, IFLA, IFIP).

The training and manpower issues have also been considered in recommendation Number 12 concerning the contribution of professional societies, in which the international federations of scientific societies are asking for the training of scientists in information processing in the requirements, techniques and use of information transfer systems through formal courses, as well as on-the-job participation in operational or pilot projects of international dimensions.

Qualified manpower also plays a very important rôle in ensuring the access to scientific and technical information which forms part of national information policies. The UNISIST recommendations which are addressed to the governments ask for the creation of suitable institutional environments for the development and improvement of scientific information. These recommendations suggest that more attention should be paid to educational issues as a condition *sine qua non* of improving the access to scientific information.

The growing sophistication of the organization, methods and techniques of information transfer makes it mandatory for UNISIST adherents to develop equal skills in this industry. However, wide disparities occur in this respect from one part of the world to another; the attention of education and science planners should be drawn to the dangers of a failure on their part to observe minimum standards in the training of all categories of personnel — including scientists — responsible for information handling. Special care should be given in this connexion to: *a.* developing adequate national or regional programmes of education in information science; *b.* providing means and opportunities for research activities in this field; *c.* improving the effectiveness of education in foreign languages, while developing, on the other hand, translation skills and facilities, as partial answers to the language barrier issue; *d.* raising the standards of proficiency in the more advanced applications of computer and communication tecnology relevant to the progress of UNISIST.

UNESCO's experience in the development of educational programmes, especially in the fields of engineers and scientists, could and should be used also in the education and training of information specialists. This concerns both teaching methods and educational management. During the recent discussions on UNISIST with the representatives of UN Agencies, this question was raised and several representatives suggested that UNESCO should be a world focal point for the training and education of information specialists and that this programme should have the first priority in the framework of the UNISIST project[6].

In the hope that for this « International Conference on Training for Information Work » the general trends in education of scientists and engineers could be of great value, I will cite several recommendations (in a modified form) proposed by the participants of the International Conference on the Trends in the Teaching and Training of Engineers, which took place in Paris, in December 1968. I am convinced that these general recommendations could also find their application in the training of information specialists:

Teaching methods, techniques and curricula

Attention should be given to the increasingly available teaching aids such as audio-visual techniques, digital computers, programmed learning, and the like. It would be desirable to provide information generally on the status of development of these aids and of their usefulness in various situations.

In general, the advances in education techniques, in methods of teaching and learning and development of curricula and course content, and in faculty development appear in many forms and are occurring in many institutions, in many countries, in different ways. These advances and developments are of greatest value to all institutions of all countries, and there should be a much more extensive organization and procedure for the dissemination of information about these advances and developments.

The design of information specialists' curricula, particularly for developing countries, while aiming at a high level of theoretical instruction, should include provision for an adequate practical orientation. In all cases, the curriculum should include those studies, reports, projects, both experimental and analytical which would provide an emphasis on creative design and an opportunity to demonstrate capability through project activity.

Educational management

In order to serve the needs of developing and small countries in the improvement of faculty staff, it would be desirable to establish an independent international re-training and exchange centre for professors and lecturers.

The initial education of an information specialist should be based on the assumption that it will be followed by continuing life-long education and all those concerned with the scientific information profession should plan on this basis.

To provide the necessary facilities for education and training, and also in the interest of international understanding, it is desirable that there should be exchanges of students and junior specialists and information on programmes and courses on an increasing scale, and that university or technical centres of industrial countries give their help and experience to the education and training programmes of developing countries.

It is advisable that informaton be available on the state of scientific information education and the profession in all countries. This should include universities and technical institutes, their organization, operation, management and financing, and the kinds of full-time and part-time educational programmes offered at all levels. Information should be provided on the structure and scope of the activities of regional and national professional societies of all types, and their relationships with the universities, industries, governments, and with each other. Such information should be prepared, in concise form, should include all countries and should be made available to all interested individuals and organizations.

The professional societies and industries should collaborate with the secondary school system in providing information and guidance on careers in information work and should also provide further guidance to students enrolled in higher education.

I would like to conclude this paper with a few words on the action which is envisaged for the implementation of the UNISIST project. As I mentioned earlier, the results of the UNISIST study will be submitted to the Intergovernmental Conference; the outcome of the conference will be the adoption of the report embodying such conclusions and recommendations as may emerge from the deliberation. It is suggested that the conclusions may express views and findings addressed to the enlightened public to summarize the consensus of the conference on certain problems. The recommendations, on the other hand, call for action; they may be addressed to the Member States, to the Director-General and to the General Conference of UNESCO, to the United Nations and its specialized agencies and to other international organizations. Based on these recommendations, an implementation programme for UNISIST will be established after the Conference and will be submitted to the next UNESCO General Conference in October 1972. This Conference would approve the programme of action as well as the necessary budget and it is expected that UNISIST, as an international programme, will begin to function in 1973.

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EDUCATIONAL ISSUES IN THE FID PROGRAMME - I

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The education of documentalists, teachers and users of information is a central FID activity. It is recognized that the availability of the qualified documentalists necessary for the efficient management of information services now everywhere needed due to the proliferation of information sources depends on improved level of entrance, career prospcts and professional status. FID training recommendations include the need to train documentalists at different levels, to take methodological and technological innovations into account by providing introductory courses on the computer, the principles of systems and cost analysis and programming etc, to recognize the inter-disciplinary nature of information science and the necessity for close collaboration between training documentalists and librarians. The growing complexity of information technology requires training users. FID recognized the advantages of introducing basic information training at secondary school and university level and the necessity of training specialist users, which is given an important place in the FID 1970 programme. Reference is made to FID studies and initiative in teacher training.

If a solution is to be found to the widely recognized need to achieve some uniformity and compatibility in information training in general and to stimulate the establishment of national, regional and international training programmes, joint efforts at national and international governmental and non-governmental level are required. The implementation of a programme of such magnitude calls for carefully selected priorities, some of which are listed in the new FID programme. The paper ends with a review of the positive efforts made to implement the recommendations of the FID-sponsored Conference on Education for Scientific Information Work (London, 1967).

The continuing progress in science and technology, as well as in all other areas of human endeavour, has been a major characteristic factor of modern society. « Today we have reached an era when mankind is experiencing the most rapid and gigantic innovation in intellectual and technological achievements »[1]. Any progress in science and technology is proceded by the acquisition and use of relevant information, and, in turn, generates further information. The importance of information, naturally, is not limited to science and technology. The last decade has witnessed the increased rôle of information in the social sciences and humanities; information has been recognized as an essential factor in decision making at various levels.

One of the characteristic features of this scientific and technological progress is the constantly increasing number of experts involved in all areas of human activity. This has lead to the situation when « eighty to ninety percent of all the scientists that have ever lived are alive now »[2]. It was estimated that the number of scientists and engineers in the world would increase from five million in 1967 to twenty-five million in the year 2000[3].

All the above mentioned is but a brief reason for the exponential growth of information characterized by some 200,000 titles (including almost 30,000 journal titles) published annually the world over. This so called « information explosion » has a tendency of continuing in the foreseeable future. « Since science began, about ten million scientific papers have been published, and we are adding to them, with a doubling in ten years, or about six per cent a year, about 600,000 new papers every year »[4].

The proliferation of sources of information and the resulting « information explosion » make it necessary for every country to have well-functioning information services. The effectiveness of information services is based not only on the equipment used. It largely depends on the qualifications of documentalists who, in the process of their work, should be aware of the latest achievements in science and technology, as well as of the needs of the national economy. It has been repeatedly stated that « only competent information specialists can assure a quick, comprehensive and up-to-date information service to the scientific and technical community, thus contributing to the success of many research and development projects »[5]. Training of documentalists (the author uses this term as a general one to cover also information officers and other categories of information handling personnel) has always been a central point in the activities of FID, which recognized that the problem of training qualified personnel was not only « fundamental to the development of documentation », but a very complex problem as well: « not only is there a need for well trained documentalists of various types, but also a need to improve the level of entrant into this activity, the career prospects, the professional status and remuneration in order that the profession may fulfil the task set to it by contemporary society »[6].

Already in 1960, the FID Programme pointed out the need to formulate and analyse the training needs of various categories of documentalists (from information officers to special librarians), as well as to differentiate the training methods applied to those various categories of information handling personnel. FID called for establishing training programmes « for several types and levels of documentation work »[7]. This idea was repeated in the 1966 FID Programme: « Some documentalists receive basic education in information science and technology or library science, while others are trained in this field with a background of another discipline of learning »[8].

In establishing training programmes one must very carefully select specific subjects to be included in these programmes. To do this well it is necessary to follow all innovations in information processing (both from methodological and technological points of view). The need for this is obvious since we live in a dynamic society and we must take into account new developments in all areas relating to information processing and transfer. One of the most important factors which has revolutionized information processing and transfer is the computer. Computers have influenced almost every area of industry, government and professional activity. Progress in science and technology has made it possible to use man-made Earth satellites for information transfer. All this has been and is influencing the entire field of information work and must have its positive impact on the training of documentalists. Introductory courses on the computer and its potential for information processing, courses on principles of systems analysis, cost analysis and programming should be included in curricula.

In training documentalists one must remember that training programmes should be of an inter-disciplinary nature since information science encompasses many ideas and concepts from library science, to computer science, systems engineering, statistics, mathematics, logic, linguistics, etc.

Library science has been mentioned above as one of the border fields of information science. It is necessary to point out that in quite a number of countries of the world documentation and librarianship are considered as two sides of one general profession called in to serve « users » in one case and « readers » in the other. The fact that many universities in various countries (six in Brazil, one in Czechoslovakia, one in Japan, one in Senegal, one in the United Kingdom, five in the USA) have combined the words « information science » (or « documentation ») and « library science » indicates that some professional circles see basic unity in what others consider to be quite different areas. The present paper is not intended to discuss both positions. The above-mentioned has been said with one purpose only: to give the author an opportunity to point out the need for close co-operation, especially in developing countries, in training documentalists and librarians. This idea was supported by the Joint Meeting of FID and IFLA Officers and Committee Chairmen in Brussels in February 1971.

The growing complexity of information technology is creating at times problems not only for documentalists but also for users of information. « Whereas the general public knows and understands what to do with a printed book or journal, no such wide acquaintance or competence exists for computer-readable information packages »[9].

Since users are actually the ones who are served by the information services all over the world, well organized education of users is indispensable for truly effective information work.

The FID Programme published in 1966 stated: « Growing interest in information activities will promote education and training of documentalists and information officers on the one hand, and teaching of information practices to users on the other... It can be expected that scientists and engineers will spend more of their time in documentation activities »[10].

The importance of educating scientists and engineers in the efficient use of information systems and networks is obvious. Unfortunately, as it was shown at the FID International Congress on Users of Documentation in Buenos Aires in 1970, there is very little, if any, co-ordination in the education of users not only at the international but even at the national level. « It is to be noted, however, that the character of subject matter given at various courses is far from being similar. The courses themselves have different kinds of titles, signifying the failure of many of those involved to have a clear-cut concept of the course content, or its goals »[11].

The international experience in training for information work has indicated the advantages of introducing the basic information training at the level of secondary schools and then at university level. This has been the subject of discussions at various FID meetings where participants have stressed the need to teach all students how to benefit from and contribute to information systems in their respective fields of work. It is necessary to point out, however, that the vast majority of scientists, engineers and other specialists of today have not had any special training in how to use the information available but too often unknown to them. Educating these people is much more difficult than educating students since in reality many scientists and other specialists are not only users but producers of information as well. « The producer » — and here I can speak from personal experience — « is mainly concerned with communicating with his own kind. He is not much interested in other people's concern with his publication, and the user is all too often unaware of what is available to help him in the way of literature aids of one kind or another. The education of both parties is something that we must all have very much in mind »[12].

In planning for effective programmes of educating information users one must study users' needs, their behaviour in varying environments, etc. The complexity of this task was described by Dr. B. Adkinson, former FID President: « But in spite of years of effort and hundreds of thousands of dollars spent on trying to identify the real needs of users of scientific information, we remain unable to describe them to anyone's satisfaction »[13].

FID has been paying serious attention to the problem of users' needs: it has been discussed at the above-mentioned FID Congress in 1970, three of the FID Study Committees — Committee on Education and Training (FID/ET), Committee on Research on the Theoretical Basis of Information (FID/RI) and Committee on Information for Industry (FID/II) — have been studying the problem during the past years.

The new FID Programme, approved by the FID General Assembly in September 1970, states that the Federation should « study the information needs of users of information, and develop programmes for better means of both meeting these needs and testing to validate the improved methods »[14].

Positive results achieved in studying users' needs will undoubtedly contribute not only to the education of users but also to « the development of methods for facilitating interchange across the interface between information systems and the users of documentation »[15].

It has been often pointed out that there is a very strong need for bringing certain uniformity and compatibility into the vast area of training for information work. It has also been repeatedly suggested that active steps be taken to set up national, regional and international programmes aimed at training the competent documentalists so much needed all over the world. The actual situation, unfortunately, is far from being satisfactory. « Appropriate measures have already been taken in some countries to provide or up-date education programmes in information science, at university level. This, however, is by no means a general course in all parts of the world: many countries, even among the more developed, suffer from a serious lack of trained personnel to set up or handle modern information systems... »[16].

To advance the solution of this and many other problems facing the world information community joint efforts of all relevant international, regional and national organizations, both non-governmental and governmental, are strongly needed.

The implementation of any programme of such magnitude could be effective if it is based on a number of carefully selected priorities. Some of the major priorities in the field of training have been mentioned in the new FID Programme, which has stated that it is highly important to

— « study the state-of-the-art, methods and problems of training of documentalists at all levels in various countries as a base line from which to make recommendations for improvements in curricula and in methods of teaching;

— prepare and publish manuals and textbooks of various types;

— organize international schools for teachers of documentation, arrange for exchange scholarships for these teachers and facilitate their interactions;

— include the theory and methodology of documentation as a separate discipline in the curricula of universities and other institutions of higher learning, in order to increase the number of documentalists with university or equivalent degrees;

— include courses on the fundamental principles of documentation in the curricula of all disciplines in universities and other institutions of higher learning, as well as technical colleges, in order to train future users of documentation; and

— organize documentation courses, at all levels, in developing countries »[17].

There are numerous ways of organizing information training in practice (from in-service training to advanced training, including postgraduate courses). Each one of them has its advantages and the selection of a specific method to follow usually depends on various factors: type and level of training required, number of trainees, resources available, etc.

The success of any training programme depends to a great extent on the qualifications and competence of those who conduct the actual training courses. Here, the author dares to disagree with Bernard Shaw who once said: « He who can, does. He who cannot teaches ».

There is an obvious need for training and advance training of teachers in information work. This can be done at seminars, summer schools and various other meetings and courses. FID has been studying the problem very closely and plans are being elaborated for setting up an international summer school for advance training in documentation work (with special attention towards developing countries).

The importance of having an international body to co-ordinate on an international level the numerous efforts in training for information work has always been fully recognized by FID. Our Study Committee on Education and Training (FID/ET) « serves as a focal point for the Federation's efforts not only in elaborating an internationally acceptable programme for the training of information specialists and information users, but also in the practical implementation of this program »[18].

A special place in the training programme of FID is given to joint practical projects with other international, regional and national organizations. The fact that FID was invited by UNIDO and UNESCO to assist in organizing training courses for industrial information officers and documentalists, which have already been held twice at VINITI in Moscow, indicates the high professional standing and experience of FID in this field so crucial for documentation.

It might be appropriate to conclude the paper with a brief review of the practical follow-up of the conclusions made by the International Conference on Education for Scientific Information Work sponsored by FID and held at Queen Elizabeth College in London in April 1967.

The Conference discussed a number of important problems, including the following:

- — lack of internationally agreed terminology;
- — forecasting future needs for information handling personnel;
- — projections of requirements in teachers;
- — organization of high-level courses or seminars for advance training of teachers of documentation;
- — interchange of teachers and visiting experts;
- — inclusion of the latest techniques in the curricula of training courses [19].

If one analyses the work done by FID in the training field during the past four or five years and compares this with the above mentioned problems raised at the London Conference, one will undoubtedly notice that the Federation has made serious efforts aimed at the implementation of the ideas expressed at the Conference:

- — the FID General Assembly has approved the proposal to set up a terminology committee thus giving us a hope that perhaps within a foreseeable future not only our training but the entire profession will benefit from internationally universally agreed and internationally used terminology;
- — the Federation has made preparations for undertaking a manpower study in our profession;
- — a survey of major trends in documentation and library training has been started;
- — it has been agreed to undertake a preliminary study aimed at setting up an international summer school for advance training of teachers of documentation, with special attention to the needs of developing countries.

The idea of extending the scope of the former FID Committee on Training of Documentalists originally raised at the London Conference has been supported and, as it has been mentioned earlier, the Committee is now called Committee on Education and Training thus clearly indicating the prominent rôle which the education of information users plays in its programme.

Allow me to conclude by expressing the hope that the present Conference will analyse the state-of-the-art in our professional training and will formulate a number of important proposals aimed at further advance in this vital area of our work.

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EDUCATIONAL ISSUES IN THE FID PROGRAMME - II

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The problems of the training of documentalists are a major concern of FID. The committee for the Training of Documentalists has gradually expanded to include the training of information users and in 1970, acknowledging its broader aims, it became the Committee on Education and Training. Poland has held the chairmanship and secretariat of the committee since 1959. The FID/ET committee, along with organizing meetings and conferences within the organization and in foreign countries, has recently been concerned with model training programmes and has issued a publication « A Guide to the World's Training Facilities in Documentation and Information work. It often works in conjunction with other FID Committees.

I. *The Study Committee on Training of Documentalists* (FID/TD): *its tasks and activities in the period 1960 - 1971*

The problems of the training of documentalists * have been the concern of FID from its inception, and constitute its statutory objectives. In the sixties the training of information users was also included in these tasks. In the previous statutes the tasks in the field of is defined as: « the study of the training of documentalists and related professional problems ». In a new FID statute they have been formulated as follows: « to promote the training of documentalists, information specialists and information scientists in developing countries » and « to study the information needs and habits of scientists, engineers and other specialists and to promote training of users in the more efficient utilization of documentation and information services ». The growth of interest in the training of documentalists took place at the end of the fifties. The developing documentation and information activities in the FID member-countries called for the employment of well qualified workers in existing centres. In the FID member-countries the existing information centres and institutes were organizing training courses for documentalists, and gradually, chairs of scientific documentation and information were also being set up at higher schools. The pressing problem of preparing specialist for posts in information centres were soon reflected in FID activities. The FID national members badly needed and even found it indispensable to exchange experiences on training and training programmes, as well as to discuss the problems connected with the improvement of training methods and forms and the problems regarding the providing of national members with handbooks, scripts and other teaching aids. In compliance with the organizations, forms, and methods of work observed by FID, a Committee was established in 1954.

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* By this term information specialists are meant.

Much attention was paid to the problem of training at the twenty-fifth Annual FID Conference which was held in Warsaw in 1959. It found expression in the Long-Term Policy adopted at the Conference. The chairmanship and secretariat were then entrusted to Poland and are still held by this country. A considerable expansion of activities in the training of documentalists took place in the sixties. The initiative in this field was mainly being taken by the Committee on Training of Documentalists (FID/TD); it was also taken by other Committees as well as national committees for the organization of Annual FID Conferences and International Documentation Congresses.

The representatives of national members concerned with the training of documentalists and information users participate in the activities of the FID/TD Committee. At present the following countries are represented on the Committee: Belgium, Brazil, Czechoslovakia, Denmark, France, German Democratic Republic, German Federal Republic, Great Britain, Hungary, Israel, Italy, Japan, The Netherlands, Poland, Republic of South Africa, Spain, The Soviet Union, Sweden, USA and also the Commonwealth Agricultural Bureau.

The increasing proportion of training of information users in the works of the Committee has led to the change of the Committee's name to the Committee on Education and Training FID/ET during the FID Conference in Buenos Aires in 1970.

The FID/TD Committee had been developing its activities on the basis of annual plans adopted at the General Assembly. Two meetings were usually organized in a year, one of them at the Annual Conference of FID. On the occasion of these conference open meetings were held, providing the opportunity for specialist non-members of the Committee concerned with the training to take part in them. Problems of training in FID activities have been gaining importance every year, due to the growing interest in them in member countries and the conviction expressed that the co-operation among member countries in the field of information can develop if information centres of the countries concerned work according to uniform methods and use uniform forms of work which will be learned by the staffs of centres through training. Therefore the problem of unified teaching programmes and teaching aids is a subject of special interest. It is worth mentioning that at the initiative of the FID/TD Committee a handbook for the teaching of documentation titled « *Modern documentation and information practices,* A basic manual » was prepared and published in 1962 (by O. Frank).

The major achievements of the FID/TD Committee in the years 1960-1971 were:

- — the organization of thirteen Committee meetings;
- — taking the initiative and an active part in the International Conference on Education for Scientific Information Work held in London, April, 1967 as well as in other conferences on training, e.g. in Turin, 1965;
- — preparation of numerous publications on training of documentalists and information users drawing into co-operation many distinguished experts who are not members of the Committee;
- — organization of professional groups for the resolution of important problems dealt with by FID; setting up of two working groups for Training of users and for the Organizaton of the International Seminar for Educational Problems in Information Science in Budapest, 1972;
- — organization within the Committee Secretariat of several information collections on training.

The topical papers which have been elaborated by the Committee members concerned the following groups of problems:

1. Methodological works regarding education and training,
2. Education of information workers in individual countries,
3. Education and training of information users,
4. General problems of the training of information workers.

Among the numerous papers elaborated by the Committee the following should be mentioned: *Training of documentalists and users of information; Study on training and status of documentalists; Problem of training of documentalists in the future; The Problem of adapting the model programmes to the trends of development of information systems; The model programmes of courses for scientific information workers; The method of programming notebooks for lecturers: Documentation-Pedagogy; The philosophy and the programme of the School of Library and Information Services at the University of Maryland; Training of technicians of information in the schools for graduates from secondary schools; Outline of the training of information scientists; Education and professional qualifications of documentalists; The analysis of information users and their information education.*

A great number of papers and problems were discussed at the last three Committee meetings at Lancut (Poland), 1969, in Frankfurt on Main, 1970 and at the Hague, 1971.

The Committee covers in its plans the current problems occurring in different periods. So, in the years 1963-1964-1965 the Committee devoted much attention to the problem of the training of specialists to be employed in information centres of developing countries. Different organization forms were discussed, and projects on financing such undertakings were submitted to UNESCO. A register of information specialists who expressed willingness to give lectures at the courses on information held abroad was also organized. The file, which is run by the Committee Secretariat, contains 270 names with personal details.

In the years 1967-1968-1969 much work was done to organize international courses on mechanization and automation of information processing. The first course of that kind was organized jointly with the FID Study Committee on Operational Machine Techniques and Systems FID/OM. The programme of the one month course provided for joining the course on non-numerical data processing with the course on the use of computers for information storage, retrieval and dissemination. The course on non-numerical data processing was prepared by the *Deutsches Rechenzentrum* in Darmstadt, and the course on the use of computers for information storage, retrieval and dissemination by the FID/TD Committee. The two combined courses, mainly designed for lecturers, were planned for the end of 1969 or the beginning of 1970 at the *Deutsches Rechenzentrum* in Darmstadt. Unfortunately, they have not taken place because of the small number of candidates.

In recent years, the problems which constitute the special subjects of the Committee's concern are: the model programmes of the training of documentalists, model programmes of the training of information users, general introduction of lectures on information at universities and other higher schools, organizing of studies and international courses at a high level (International Academy of Information and Documentaion, summer schools for lecturers, international chairs of information at selected universities, etc.). What deserves stressing is the resolution prepared by the FID/TD Committee at the meeting at Lancut, 1969, which concerned the inclusion in programmes of university studies the lectures on information for students as the present and prospective information users. It reads as follows:

> It is hereby resolved that UNESCO recommends to appropriate agencies in its member-states responsible for education, that they shall ensure that adequate time and facilities for the training at universities and other institutions of higher learning in the use of scientific and technical literature and documentation be included in the curricula.

The resolution was delivered by the Secretary General to UNESCO in 1970, with the suggestion that it be included in recommendations adopted by the UNESCO General Conference and be distributed to all members.

Although for various reasons not all initiatives taken by the FID/TD Committee could be, carried out, with the passage of time most of them have however been implemented. These facts indicate the accuracy of problems chosen by the Committee. One of them is the implementation in recent years of projects for the organization of training for documentalists from developing countries. These projects had been proposed much earlier by the Committee and ultimately organized at the initiative of Prof. H. Arntz (vice-president of FID) for African countries and financed by Friedrich Naumann Stiftung from Bad Godesberg. Lectures at courses are conducted by many widely known specialists in the field of information who are at the same time active members of FID. The training courses for documentalists from developing countries organized by VINITI in Moscow in co-operation with UNESCO and UNIDO are another example of that kind.

The International Conference on Education for Scientific Information Work organized in 1967 jointly with ASLIB is to be recognized as a valuable initiative of the FID/TD Committee.

In the Conference sixty specialists (who presented thirty-three papers) participated. The Conference took the view that current problems of interest to scientific information services should be taken into consideration when training documentalists, and that modern teaching methods should be worked out and lecturers of information problems be better prepared as far as pedagogical methods are concerned. Undoubtedly, the consequence of that conference was the focusing of FID/TD Committee's attention on concrete problems concerning the improvement of teaching forms and methods, among them the elaboration of model programmes, problems of terminology which have not as yet been finally determined in the field of information, problems of quantity and quality of informaton personnel as well as contents of training curricula.

The problem which needs to be especially stressed is the twofold elaboration and publication by FID of « A Guide to the World's Training Facilities in Documentation and Information Work ».

II. *The problem of training in the field of information and documentation in the world*

The opinion on the above-mentioned problem can be provided by the two editions of the « Guide ».

The first edition of the « Guide » was released in 1965, and in 1969 the second enlarged and revised one [FID 461] was issued. It is a work published jointly by FID and the Central Institute for Scientific, Technical and Economic Information in Warsaw, Poland, prepared by the Secretariat of the FID/TD Committee on the basis of numerous data made available by the member countries of FID.

The material collected by the FID/TD Secretariat permits an analysis to be made of the existing state in this field all over the world. In 1968 - 1969 training of information workers was being run by over two hundred organizations in forty-seven countries (universities, schools, training departments in information centres, etc.). It contains data concerning post-graduate studies conducted in twenty countries, academic studies in the field of information and library science in twenty-two countries, type-course training and other types of non-graduate professional training in thirty countries, special training (courses on mechanization, classification) in fifteen countries, and the training of users in eighteen countries.

The conclusions which can be drawn from the analysis may be presented in general terms as follows:

1. The quantitative and qualitative development of the training of documentalists and information users in the world is progressing rapidly.
   The comparison of data collected for the first edition of « Guide » (data from 1963 - 1964) and the second edition (data from 1968 - 1969) confirms the above statement.
2. Much attention is being paid to the problem of the training of documentalists in some countries.
   Among them are for example: Great Britain, France, the Soviet Union, the United States of America.
   And in such countries as Denmark and the German Federal Republic much attention is being devoted to the training of users.
3. In many countries the training of documentalists and librarians from special libraries is being conducted by the same teaching organizations, and accordingly — at universities by the same faculties.
4. In some countries the training of documentalists is conducted by universities or other higher educational institutions, e.g. by technical universities.
5. In many countries the subject of information has been introduced into the curricula of high schools; in some countries it has been introduced also into secondary technical schools.

The editions of the « Guide » illustrate the rapid quantitative and qualitative growth in the group of institutions concerned with the training of documentalists in the world. The rapidity of the changes indicates the vitality and actuality of the problem.

III. *The problems of training in the programmes of FID Conferences and International Documentation Congresses*

These problems have constituted an important item in the annual conferences programme of FID; they have been especially widely presented at International Documentation Congresses as, for example, at the last three International Documentation Congresses: in Washington, 1965; in Tokyo, 1967; and in Buenos Aires in 1970.

According to the programme of the congress in Washington three symposia on training were held. As many as twenty-one papers were delivered. One symposium was held in Tokyo where five papers were presented. Nine papers on the training of information users were delivered at the Congress in Buenos Aires. Papers for symposia included in the programme of international documentation congresses are delivered by committee members and specialists in the field of training of documentalists who are not members of the Committee.

IV. *The problem of training in the work of other study Committees of FID*

The problems of training are also the subject of interest to other study Committees of FID. Recently these problems have been the special concern of the Committee for Developing Countries FID/DC, Committee on Information for Industry FID/II and Committee on Operational Machine Techniques and Systems FID/OM. These Committees closely co-operate with the Committee FDI/ET.

V. *Co-operation of FID with other international organizations in the field of training*

The International Federation for Documentation has been closely co-operating for many years with UNESCO in the field of the training of documentalists and information users and this year the scope, methods and forms of co-operation on that matter have been determined jointly with the International Federation of Library Associations.

Through this co-operation with UNESCO, research works, analyses, projects, handbooks and teaching aids are being prepared by FID.

VI. *Conclusions*

Many problems exist which are included in the wide scope of problems on training and need to be solved. The introduction of new technology into information processing, growing demands for elaboration and introduction of new forms and methods of information in order to meet users' needs effectively, the necessity to raise effectiveness in information work and the project to build a world system of scientific and technical information, bring the problem of the training of information workers and users to the fore among the complex of problems which need to be solved in the field of information and documentation. These important tasks are facing FID now and in the future.

Wojciech Piróg, electrical engineer (M.Sc.EE.), graduated from the Institute of Technology in the interwar period. For twenty years he worked in the industrial field including the management of the enterprise for the reconstruction of Warsaw immediately after the war. Since 1961 he has been concerned with scientific, technical and economic information. He was Director of the Central Institute for Scientific and Technical Information in Warsaw and, since its reorganization in 1971, Director of the Institute for Scientific, Technical and Scientific Information (IINTE). Mr Piróg is an active member of FID, Chairman of the FID Committee on Education and Training and, since 1966, a member of the Council. He is also a member of the Executive Committees of the Polish Electrical Association and the General Authorities in Federation of Technical Associations — NOT — and Vice-President of the General Council of the latter. He has published widely in Poland and abroad and under his guidance the Post-Graduate Study in Information Science is now being implemented at Warsaw University.

THE RESPONSIBILITY OF THE STATE FOR TRAINING IN DOCUMENTATION AND INFORMATION

by

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Quoting from an OECD report which stated that « information is the rational shaping of the future », the paper points out that the State has often overlooked its own best interests by failing to assume more responsibility for the training of documentalists, above all, scientific documentalists: the scientists from other spheres who, through comparatively short training in documentation, have acquired the ability to handle the user profiles of their particular branch and on whom human progress will increasingly depend since only they will be in a position with increasing specialization to supply the specialists with information. The quality and range of information available to a government is an obvious factor in its effectiveness, hence its responsibility for the training of the documentalists of whom exacting professional qualifications and commitment are required. While training has been undertaken in a centralized way in Socialist countries since the 1950's, in the West much of this training has been sponsored by industry. It is emphasized that this training, which must be undertaken by the State in developed and developing countries, will not only benefit nations individually but will expand the possibilities for international information exchange. Reference is made to the inclusion in the FID priority programme of the establishment of an International Summer School for the information sciences: an institution for post-university studies for documentalists of all nations.

The State has created precedents to the extent that in many countries librarians and archivists are trained in State-run institutions. It is only due to the circumstance that their profession is so young that documentalists have still to fight for these State-run training establishments. This process, which is advancing at varying speeds in individual countries, does not, of course, form the content of my address.

It is, however, possible to draw a parallel from this. The libraries for which the State trained librarians were as a general rule public, state-run much as were those of the schools and the universities, the public and the municipal libraries, and because of their functions, the church libraries were on a par with them. With industrialization and industrial research this situation changed, and as a consequence the private sector of the economy set up not only works libraries but also scientific libraries which need fear no comparison with public libraries.

The industrial librarian who came into being in this way has precisely corresponded to the documentalist; and the appreciation on the part of the State that it is necessary to keep to a uniform State-sponsored training if only because of the direct benefit the State derives from industrial activity would, *a priori*, apply to the documentalist as well. For an appreciation of this: today the documentalist plays an important part in many public institutions, but the private sector of the economy was decades ahead of the State.

This parallel is, therefore, not even necessary if one considers the change that has come about in the attitude of the State towards documentation. « Information is the key to the rational shaping of the future », it says in an OECD report, and it is now generally recognized that the same importance is attached to it as to research and development, and that those responsible for research and development have to pay it the same attention and ensure its appropriate financial covering, as expressed clearly for the first time in the 1959 Weinberg Report.

Oddly enough, for a long time this has held good only for what is called in English STI and in Germany WITID — scientific and technological information. This may have some connexion with the notion that, because scientific research entails a great deal of expenditure and the experiments cost so much, pride of place, if not indeed a monopoly in research and development is to be allotted to natural sciences. Ever since the Weinberg Report it has no longer been possible to contest the fact that the State bears the responsibility for covering information needs, at least in these spheres.

In OECD, the conference of the Ministers of Science in the spring of 1963 expressly endorsed this principle, and it was decided to set up a National Focus for Documentation in each of the member-states. In the socialist countries the process had already begun; central institutions such as VINITI in the Soviet Union, CIINTE in Poland and so on date back to the 1950s; with the essential difference from the practice in the West, that industrial and economic information was always incorporated in STI.

It was inevitable that even this limitation would have to disappear. The Soviet Union has founded her own all-Union institutes for medicine, building and architecture, and recently also for the social sciences as well. Moreover the latest OECD report, « Information for a Changing Society », at last put forward the idea of an entirely comprehensive information system embracing all spheres of public, communal and private life. Though none of our present information systems can measure up to this project, the only road to it, if we wish to realize it at all, is to train qualified, committed experts aware of the problems.

Before going into the matter in detail, the group of genuine information scientists should be excluded. Anyone who engages in a course of specialized scientific studies will always do so at a State-run university or college. Here, the essential obligation on the part of the State lies in instituting appropriate professorships. For some spheres this presents no difficulty (for example, in the Federal Republic of Germany there are numerous chairs for medical documentation and statistics, or for informatics); but in most countries obstacles still stand in the way of the information sciences as such whose special importance as a branch of science is only reluctantly acknowleged by the faculties. I said this group might be excluded as a factor since the State has quite simply the same obligation towards the members of this group as it has towards medical men, jurists or any other group of scientists. The problem presents itself rather, in the first place, for those who in my country are called « scientific documentalists », which means scientists from another sphere who, through a comparatively short training in documentation, have acquired the ability to handle the user profiles of their particular branch.

All the indications are that human progress will be increasingly dependent on this group, since only it will be in a position, with increasing specialization, to supply the specialists with information. It is, however, just as essential for the contribution of a chemist to the national aims, to the innovations that lead to an increase in the national product, that in his activity he is supplied with information (which merely because of time and language he himself cannot supply) just as it was essential for him that during his studies he attended lectures on chemistry. Again one is forced to the conclusion that the State which finances study facilities, cannot possibly escape being responsible also for the training of documentalists.

This applies in the first instance to the scientific personnel, but on the other hand these cannot, in principle, in the training period be separated from the « documentalists holding a diploma », meaning those who take up documentation as a lifelong profession after having had a grammar school or comparable education. Nor is this intended to cancel out the differences in level and responsibility.

If those who are responsible for information direct the State's attention towards its responsibilities, they are indulging in no propaganda on hehalf of their own profession. Indeed, the breath of the persons engaged in supplying information has often been taken away by the speed at which knowledge of the value information possesses has grown and how rapidly the conviction has gained ground that, with the restriction to scientific — especially when « science » is taken to mean simply natural sciences — and technological information, the usefulness the information can have for the community as a whole is reduced to partial aspects. Under these circumstances, no one will blame those who at a Government level have to take decisions on training if they have not yet grasped the implications of this field that is foreign to them.

In the autumn of 1970 the Austrians organized international information meetings which were intended exclusively for managers: directors of industrial undertakings responsible for documentation facilities: officials in Ministries possibly possessing such centres, services or, perhaps, data banks in their lower authorities. Only with such verification of the problem can the appreciation of the need for information grow, and it is only this appreciation that can, in its turn, inspire the actions that guarantee that the State throws the whole of its weight into training.

In saying this, the value of information should not be restricted to the present position. A keyword such as « pollution of the environment » makes it clear that the application of even the best information can lead to disasters if the consequences are not borne in mind. If with this is meant not only direct technical results but also social effects, the importance that must be accorded to the comprehensive training of people that makes an advanced view of the future possible, will become even clearer. This is described as « information policy » (without detracting from the other components contained in this word), and policy (especially a policy that places world knowledge in the service of one's own country), should certainly be a task of the State.

Since there is talk already of policy, the reference can be still further extended. No matter what the form of State, a Government must set store on gaining the confidence of the people it governs. The more the State has the whole spectrum of information at its disposal, and the more professionally distinguished are the people who analyse the information to place it at the disposal of the Government, in evaluated condensation the more the Government can advance from emotional propaganda to well-grounded information that will not fail to make an impact on the electorate. For information in this global method of approach it signifies no discredit even if its results are of direct service to the policy of the State.

The parallel to the enterprising policy of the private sector of the economy is not only obvious, but it has already been said that management has recognized the significance of information much earlier than the authorities.

Perhaps the impression is arising that, in the light of this new approach to information, science and technology might be underrated. This cannot be the case at all, since a country's prestige largely depends on its scientific and technological achievements. Indeed, this applies directly to the military potential, since according to their present position weapons systems are subtly contrived applications of the most modern scientific and technological perceptions.

If we take another look at policy and the electorate, it is almost unnecessary to say anything about the education of the users. The service that the State renders, in addressing the information to the proper place, will be all the greater the more the State succeeds in instructing the potential users of the information as to its proper use.

The question as to what people the State has to train cannot be divorced from the institutions for which they are trained. The present complicated systems, particularly those that operate with large computers, call not only for people who understand something about technical information but also for those who are acquainted with the techniques of modern mechanical units — programmers, system planners. computer technicians. *These cannot, however, handle subject field contents just as a bywork. Even if they store and reproduce medical literature, the selection and evaluation, with the computer storing as with the answering of questions, can only be the task of medical men well-trained in documentation, and the same holds good for all other special branches.*

Herein doubtless lies the chief reason for the misunderstandings of the essence of the young branches which only in their entirety constitute « the information sciences ». Overlapping are parts of other branches: statistics (articulately evident in medicine but also in economy), psychology and sociology (possibly those of the users) and, with the extending use of mechanical installations, increasingly, informatics, used as a collective term for all the knowledge that is required for the effective operation of these highly specialized mechanical techniques — including the high expenditure of effort embodied in the word « programming ».

If, however, informatics and documentation are described as interchangeable, or if it is proposed to integrate documentation in informatics, to say nothing of allowing informatics to take the place of the information sciences, it is again apparent how the information sciences still seem immature to many people. In oceanography, for example, although it is not very much older, it would no longer occur to anybody to let the « nautical men », (that is, those whom the French call *« physiens océanographiques »)* of whose importance there is no doubt, deal with oceanic biology as well, just as in the sphere of linguistics nobody would entrust a scientifically trained phoneticist with historical Greek grammar. Informatics and documentation, both indispensable in the general range of the information sciences, can develop successfully only if they, in training too, quickly overcome the initial fault which lay in the fact that, because of the simplicity of the first mechanical systems, the lack of trained personnel and the preponderance of formal characteristics (classification, bibliographical intake, card index arrangement, formats and so on), the financially appealing impression was formed that it was possible to meet the demands of two fundamentally different professions with the same staff.

If one considers the flood of literature and data, and as a result the fact that from day-to-day the community, in all its professions and ramifications, is becoming increasingly dependent on the information selected for it, one must come to the conclusion that the State must make particularly high demands on the professional qualification and commitment of the persons to be trained for documentation. There was a time when it was a punishment for an engineer to be « degraded » to the procuring of literature for his colleagues' problems. Today, there should be no higher honour than to handle specific profiles of users, with their ever more complicated and ever more detailed queries, from an increasingly larger mass of literature and data, and to meet exact requirements. It may be that the handling of user profiles is felt to have a one sided character, and the high value we give it here ought not to be at the cost of other components. The choice of the correct literature, that initial operation of the collection, its condensation by abstracting, the allotment of keywords and the classificatory breakdown, the indexing, the content evaluation of literature, the « information analysis », the painful weeding-out of what is obsolete or no longer required, the preparation of general reports on the basis of a mosaic of abstracts, the terminological clarification, the translation, paying proper regard to the contents — these and other tasks give some indication of what is in store for the State if it promotes « documentalist training ». The magnitude will also be immense: the figures of more than 100,000 persons already employed in the information system of the Soviet Union alone, and more than 150,000 throughout the COMECON area, give some idea of this.

It may be remarked in passing that the State has always acknowledged this obligation in a sector in which it is not a question of its own potential — development aid. There, documentalist training has for years been financed out of the donor countries' public funds, whether via private foundations, as, for example, in Tunis and Kampala, or via international organizations such as UNESCO and UNIDO, as for the three-month courses in Moscow.

With this the principle has evolved that basic training ought to take place in the developing regions themselves and, as a matter of expediency, regionally according to linguistic areas, whereas training at a higher level can take place both in developing territories (UNIDO seminar in Teheran) and also in industrial countries.

There is much to be said for not restricting even this preference to developing countries. The many demands made on the documentalist also include a knowledge of foreign languages. Nothing can replace its practical acquisition in the foreign country, quite apart from the fact that co-operation between people of various nations, still considered in many areas as progress worth mentioning, forms part of everyday life in documentation. In its priority programme the FID has, therefore, included the inauguration of an International Summer School for the information sciences: an institution for post-university studies of documentalists of all nations.

Such a facility will be a visible expression of the appreciation that the knowledge of the world is indivisible and that its free flow is a concern of all mankind. With this international project the State comes forward as a benefactor as it does with training at a national level. The expenditure expected of it in order to train documentalists and all other experts engaged in information work, and to continue to advance their training throughout their life, as is demanded by the rapidly changing situation in this dynamic field, will be amply counterbalanced by the advantages that, on the other hand, the state derives from a better organization of the information system, and particularly a more successful mastering of information problems.

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MANAGERIAL RESPONSIBILITIES IN INFORMATION TRAINING

by
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Industry is for its management and operators dependent on a wide spectrum of information from both internal and external sources. Information management and processing is now becoming recognized as a professional activity.

Industrial managements therefore should stimulate and support professional training for a variety of functions in the information field such as records management, industrial libraries, information officers and information specialists. More stress should be laid on managerial and environmental aspects of the flow of information.

Especially the larger firms with great experience in modern staff training techniques should cooperate with professional organizations and where needed provide part time teachers.

Industry should also stress its views on the importance of information use and information transfer as subjects in all curricula of universities and other institutions of higher professional education.

In the past two or three decades there has been a growing awareness of industry's concern in education and training. Industry — like other sectors of modern society — is highly dependent on the educational background and professional training of people who carry out the various tasks which have to be performed in order to reach its goals and objectives. Industry therefore has to be interested in general education in schools and universities, as well as in courses and professional training in specialized institutes. It must additionally give proper attention to training on the job and internal staff training courses. This interest has led to industry being involved in discussions on educational standards and university programmes and to the creation of training departments within industry itself.

Education is expected to transmit between generations the culture of a society and to inculcate the skills needed for people to function in it.

Modern society is characterized by complexity, rapid cultural and technological change and abundance of information. Inevitably this must lead to changes in educational patterns and training needs. In universities and colleges a shift in accent is bound to take place from the simple transfer of knowledge to the imparting of the skills required for continued learning and handling of the information coming from many sources. Industrial training departments are coming under increasing pressure to meet the needs resulting from rapidly changing technical and administrative work patterns, and to adapt to the changing intellectual mould of university graduates entering industry. For this and other reasons education and training are a management sphere of interest of increasing importance.

When comparing the organization charts of industrial — and other — organizations of say a few decades ago and of today, considerable changes emerge. Such changes may reflect technological and social developments, new approaches in personnel and industrial relations; in a number of cases they also result from the growing awareness of the important rôle of communication and information in the overall conduct of business. The impact of the so-called « information explosion » and the development of the computer as an information machine is unmistakable.

As no business decision will be better than the information it is based on, management information systems (MIS) have been developed. Such systems deal mainly with financial and statistical data on all aspects of an enterprise. It is obvious that computers can play an important part here. At the same time the users of these systems came to realize that in themselves they are not sufficient for well considered decisions. In our present highly complex society decisions in industry — as in other sectors of society — often demand selection of information from a variety of scientific and technological fields, together with environmental information of all sorts. Internal and external reports, scientific and technical journals, and economic surveys form an indispensable source of information both in the process of decision-making and in the implementation of decisions. Not only numerical but also « narrative » or « documentary » information in its various forms is a part of the information base which industry has to work with. The daily mass of external correspondence, internal notes, and so on, is another important source of information. There is an increasing awareness nowadays of the need for an integrated approach to information handling in all its aspects and phases. Adequate management information demands information management.

Just as the flow of money and personnel, the flow of raw materials and products acquire their own functional organizations and managements, the flow of information has to be the responsibility of an information manager.

Integrated information management has to take responsibility for a number of seemingly quite diverse activities. When determining the scope of information management one is obviously inclined to think first of electronic data processing because of the high expenditure involved, and of the strong impact on the organization of work in data-producing divisions. However, full account must be taken of the complete spectrum of information activities. Archives and records management, libraries and documentation, means of communication, translation, report writing, printing and reproduction all play a vital part in the flow of information and ask for specific professional skills.

Attention should also be given to the fact that in laboratories and research and development divisions there often exists a kind of informal information network built up around some staff members, who more or less act as internal consultants thanks to their communicative qualities and their professional contacts outside the firm or institution they work in.

Management has to assess the information needs, the factual organization to meet these needs and its effectiveness. Well designed O & M studies, function analysis and job evaluation are indispensable for defining the different levels in information work and the qualifications and training needed.

Once information is recognized as a business aspect in its own right there arises the question of quality of staff. For too long managements have been inclined to use libraries and other information units as outlets for staff who are less useable elsewhere. Organizing the flow of paper in an office, the transfer of information in an R & D organization, the administration and documentation of a large collection of technical drawings, selection and abstracting of published literature, devising a computer program for SDI, are professional jobs and should be performed by professionals who are paid as such. Since one of the main tasks of an information department is to see that information is neither compartmentalized nor profusely disseminated — in both cases information loses its value as a driving force — information staff in key functions have to be of high personal and professional quality. It is the responsibility of management to create the proper conditions for building up an adequate information staff and in consequence to pay attention to education and training both before and after employees join the firm.

Industry expects the national educational system to produce people equipped with the basic knowledge and skills needed for the various tasks they have to perform. Since governments recognize the important rôle of scientific and technical information for industrial and social development, they have the task of seeing to it that in academic education and professional training information use and information transfer receive due attention. In this respect still much needs to be done.

To begin with, it is in industry's interest that graduates leave the universities with the habit of making efficient use of available information faculties, such as libraries, archives, information services, data banks, etc. and with sufficient insight to enable them to communicate with the professional information staff who are indispensable in an organization of any size. In session two of this conference this point will certainly receive special attention.

Industry, where possible in conjunction with relevant professional associations, has to exert pressure to ensure that in the reform of academic teaching, which is being sought in many countries, due attention is given in all faculties to information use and transfer. It also has to be brought home to those responsible for national educational programming that a coherent system of professional training faculties for information handling in all its phases and different levels will come about.

Despite the rapid development of electronic information storage and processing, paper is still the major carrier of information. The structuring, the flow, the filing of documents of all sorts containing a company's proprietary information are still basic to all further information handling.

Records management is a profession and well-trained staff in key-position are a "must". Where no training in this field exists industry should in its own interest promote the setting-up of appropriate courses.

It also should be urged that in courses for management consultants and organization advisers the importance of the flow of paper in an office be given proper attention as an organizational aspect.

To ensure that a relevant selection from the present mass of publications becomes available to those interested and that unavailable material can be located and obtained easily and quickly via the national library network a competent librarian is needed. Industry should stimulate and support the development of courses *for special (industrial) librarians,* where not only traditional and new methods are taught, but where understanding of the industrial environment is fostered and user studies also occupy an important place in the curriculum.

For literature searching and reporting, document analysis and information evaluation *information officers — or scientists —* are needed who have specialized both in a subject field and in relevant information techniques. Where universities fail to provide this type of graduate, industry should emphasize that there is such a market and where possible support the setting-up of such specializations.

Although in the near future the computer will not take over or replace the tasks of the information intermediaries mentioned earlier, its impact on existing and future work patterns will be considerable. Clerical routines are being mechanized, new tools for SDI and information retrieval are becoming available, a shift in accent from literature to data documentation can be observed, and the need for more uniformity or standardization in information handling is making itself strongly felt. To guide these developments capable *information specialists* are needed who combine information organization and systems expertise, and computer knowledge and are able to judge the cost/effectiveness of new and existing systems and methods.

In view of the growing importance of this relatively new function it is not surprising that a continuous discussion is going on about the proper content of education and training programmes for this function. Here, industry can contribute by stating its needs and views not least on such questions as: should the curriculum primarily be application or science-oriented; what should be the intellectual background of the students; what should be the place of information research in the programmes?

Industrial management must make clear to those experimenting with training programmes in this field that it wants not just computer experts for a special field of application, but all-round information experts with a broad scientific background, who can operate in a complex and changing environment on the basis of fundamental studies of a variety of subjects, i.e. graduates well equipped for continuing learning in a new and rapidly developing discipline. Not only the scope and contents of training programmes, but also the quantitative needs for the near future are industry's concern. Industry should give its view or at least give full support to activities aimed at assessing future manpower needs for information work.

During the next ten years the present shortage of competent staff for a range of information functions will continue. As information handling in many aspects is still in the process of becoming a professional activity, there will, in addition to university education, be ample need for training courses and seminars at different levels for those who change careers and take up a function in the information field as mature entrants. In the present situation the least industry can do is to provide active support to professional associations who are prepared to take these matters in hand. One of the advantages of such courses is that a group of students with similar interests, but coming from different work situations with diverse experiences, is ideally suited to the use of modern training methods. Group discussion and project studies already successfully tried out in industrial training are excellent methods for information training. Industrial experience could be of great assistance here. The co-operation of industry — especially the larger companies — may also be needed to provide experienced teaching staff, part-time or for a limited period. Opportunities for training assignments and for project studies in information transfer and information use should be also offered. As the computer technology will gradually effect considerable changes in existing work patterns, supplementary training of staff in all types of information functions is of paramount importance. Understanding of the new technology, its possibilities and limitations, is vital for effective co-operation among all concerned. Management of a company of any size has to make provisions for the re-training of existing staff both to make them conversant with changes that will inevitably occur and to confront them with the challenge of actively participating in the development of new tools and methods.

At the beginning of this lecture I drew attention to the shift in educational thinking from considering it as a simple transfer of knowledge to a preparation for continuing learning. This approach is of particular importance when a profession is developing in a situation of rapid change. Managements should realize that systematic periodic re-training is necessary in this field.

Managements that accept their responsibility with regard to information training will find that motivation is both a condition and a result of succesful training.

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UNIVERSITY TRAINING OF INFORMATION SPECIALISTS

by
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The proposal is made for an integrated approach to the university training of information specialists which would include, besides a grounding in library and documentation sciences, computer, communication, management, and system sciences. The last two are of particular importance for the design and operation of large information systems oriented towards the solution of scientific, technical and social problems. Particular emphasis is given to the training of researchers in the area of information sicence and the need for a strong background in mathematics, systems engineering and the human sciences.

1. *Introduction*

Recognition of the importance of the transfer of information had already begun before the First World War, but it is only recently that it has been recognized as a basic element for economic and social progress.

As a consequence growing attention has been given to the training and educational problems in this area.

An examination of a recent FID[1] survey on training facilities for specialists in information work shows that the major part — more fifty per cent — has, in fact, only got under way in the last five to ten years!

This growing interest is also shown by the increasing number of papers, review articles[4], symposia and conferences[3] specifically dealing with the training of information specialists. Last, but not least, this very conference, the aim of which is to evaluate precisely, the progress that has been made in recent years and to discuss the various aspects of education and professional training for information work.

Between the time of the writing this paper and the present Conference, many other events will have taken place, such as the IFIP conference in Ljubljana, the ISLIC conference in Tel Aviv and the UNISIST conference in Paris. This last event is of great significance, because it is a UNESCO conference aimed at making recommendations to governments, as well as to all other national and international bodies concerned with a general advancement in the field and greater international co-operation, in particular in scientific and technical information.

An important item in the UNISIST programme[2] is the education and training of both specialists and users. There can be no doubt that tht success of the whole programme in the long run very greatly depends on an early educational effort.

Besides these events we have also to recall that these problem are continually under discussion within various national and international organizations, including among the latter inter-governmental agencies such as UNO, UNESCO, OECD, EEC as well as cultural and professional associations such as FID, IFIP, ICSU and other organizations more specialized in particular fields.

Further details on these matters will be reported in other papers, but I felt it necessary to start by mentioning them here because the university training of information specialists must be seen within this general context and not as an isolated problem.

Education and training for information work is in fact a social problem of great importance because it not only concerns science and technology, but all sectors of human activity, including policy-making and decision-making at all levels.

This is an important point and I shall return to it after a brief discussion of the present situation, since before any detailed discussion of what should be done, we have first to establish what are the objectives to be achieved.

This is particularly important when discussing educational problems, since these are essentially long-term problems, hence a far-sighted even if realistic view must be taken in order to anticipate rather than lag behind technological and social changes.

2. *The present situation*

The present situation is far from satisfactory in advanced and also in developing countries.

Most training in information work still takes place either at work or through short courses of a few weeks and sometimes even of a few days. This is clearly inadequate and the need for universities to play a greater rôle in what concerns both training and research goes without saying.

The situation is particularly complex in western continental Europe. Even if some good training as well as research and development work have been done, especially in France and in Germany, they have usually occured in research centres outside universities, and thus have had little impact on the university structure. Something more has been done in the case of computer specialists: but even in this area a much greater effort is required to meet the large demand for systems analysis and for computer experts and better qualified experts.

In France the *Union Français des Organismes de Documentation* (UFOD) and in Germany the « *Lehrinstitut für Dokumentation inder Deutschen Gesellshaft für Dokumentation* » (DGD) are particularly active: but neither of them are university institutions. As a consequence although France and Germany are to be considered as advanced countries in documentation and information work, there is a need for greater university participation.

In Italy the situation is worse, since a well-established body which deals specifically with information work and documentation does not yet exist. As for universities we have to mention the recent establishment of a full four-year graduate course in « Information Science » at the universities of Pisa, Bari and Turin. Despite the name, these courses however, are mainly courses in Computer Science, or informatics, rather than in Information Science and documentation. They offer, however, an applied, mainly business-oriented, option which includes courses in automatic documentation and machine processing of natural texts and of non-numerical information.

Rather different and much more advanced is the situation in the UK: see 3, 7. Important developments started in the UK even before the war and have continued with strong co-operation between leading universities and the very active Association of Special Libraries (ASLIB), the syllabus of which has become the basis of most curricula particularly for undergraduate and post-graduate training. In the UK a clear distinction is usually made between information scientists and information officers, to be further distinguished from both librarians and computer scientists, and computer experts at the professional level.

Somewhat more confused, but very lively and rather advanced, is the situation in the USA: see 4,5, which has been strongly influenced by the exceptional development and rapid diffusion of computers in that country. Major efforts in the USA have been made above of all in the area of computerized information and retrieval systems, and also (partly a consequence of extensive developments in management and system sciences) in the area of library automation and in the planning of libraries and technical documentation centres. A full account of the situation in the USA can be found in the well known series *Annual Review in Information Sciences*[4]. A most interesting analysis of the situation in the USA has recently appeared in the *Journal of the American Society for Information Sciences* which describes the results of a detailed investigation of the actual content of courses concerning or related to Information sciences which was performed in order to obtain a possible model for Information Science curricula.

The situation in Eastern European countries also appears rather advanced. Major developments have occured not only in the USSR with its famous VINITI (all-Union Institute for Scientific and Technical Information) which gives a post-graduate doctoral course in scientific and technical information with three main specializations: scientific and technical information; computing technology; structural and applied mathematical linguistics, but also in some smaller countries like Poland and Czechoslovakia, which are quite active on the international scene.

Furthermore the developments in India are worth mentioning. These have been stimulated by the extensive research in the area of classification on which S. R. Ranganathan has been working since 1933.

The preceding summary of the present situation in no way pretends to be anything more than a brief introduction to our discussion: it is in not complete and is intended merely to show that there are great variations among the various countries, and a general need for development and co-ordination.

Further details can be obtained from the previously mentioned FID report[1] which contains an almost complete list of all the courses with their programmes in the various countries.

3. *Science, Society and Information*

A most salient feature of the present time is the growing consciousness that the entire social and economic progress of mankind, extending even to the very problem of man's own survival, will depend more and more on our capacity to apply the methods of scientific research to all human problems and in particular to those concerning a careful management of natural and human resources.

This implies a change of attitude towards science and scientific research which can no longer, or at least not only, be viewed as self-supporting activities oriented towards goals of a speculative nature, but must be seen rather as a basis for constructive actions aiming at the solution of economic and social problems.

This attitude has been clearly recognized by the UNISIST report as the deep root of present day changes in the organization of science.

> « In contrast to the compartmentalization of science in the ninteenth and early twentieth centuries into academically defined disciplines, large scale public funding of science for social goals, energy sources, food supply, health and national defence, has resulted in what has become known as 'mission-oriented' research. Perhaps 'problem solving' would be a more appropriate term... »[2].

There is, in fact, no doubt, at least from a social point of view, that the ultimate value of science and scientific research is its applicability to the solution of human and social problems.

This factor shapes the entire information problem, since problem solving is a typical multi-disciplinary activity, based on the collection, analysis and evaluation of all available relevant information.

It shows also the very close relationship between management and information sciences, since the main functions of management, policy-making and decision-making, are based on the same operations i.e. collecting, analysing and evaluating pertinent information.

The progress of science and the increasing usage of the scientific method in solving economic and social problems imply the need for handling an increasingly large amount of data and information.

Fortunately, modern communication and computer based information processing techniques are providing new basic tools for the development of automated and semi-automated information systems, capable of meeting the growing demand for information and the solution of more and more complex problems.

Information science cannot be reduced to computerized information systems, but computer technology has entered the information world once and for all as a basic component.

We must, furthermore, realize that we are only at the beginning of this new era: much progress still has to be made before we can achieve a satisfactory integration of the various components of the information world into a « total information system » as envisaged by Calder:

« think of a system incorporating the computing, publishing, newspaper, broadcasting, library, telephone and postal services of the country together with large slices of teaching, of governments, of industrial and commercial operations and of many professional activities »[6].

This quotation has been used by an OECD group of experts, entrusted with the examination of the implications of developments in the areas of information computers and communication from a global point of view.

It will probably require much time and much research and development work before we reach such a total information stage. But there is no doubt that we are progressing in this direction as the only way of solving the ever growing problems posed by technological progress itself as well as the growing need for social security, welfare and prosperity.

A major rôle in this respect is to be played by universities for what concerns both specialists' and users' training as well as general education and research in all aspects of information science and technology.

This is an important point which can hardly be over-emphasized, since universities cannot and must not renounce their institutional rôle of being a central focus for educational problems and for the advancement of science and technology.

4. *The scope of information science*

A discussion on curricula in information science should be based, at least in principle, on a clear understanding of what is to be meant by that term.

This is not an easy task, because there is still little agreement among experts as to the content and scope of information science, and the nomenclature used reveals great variations among the various countries and sometimes even within a country.

A first possibility is to consider information science in a rather strict sense as roughly equivalent to « documentation science », i.e. as:

> « the body of knowledge concerned with the technologies for information transfer in science and technology » that « includes besides librarianship and information work (as a professional), some more modern branches such as linguistic analysis, computer science, etc. as applied to information transfer » (UNISIST Glossary).

A much broader approach can also be taken. It consists in considering the concept of information in its widest sense, and including within the subject matter of information science the study of all parts of linguistic and non-linguistic communication, as well as the study of natural and artificial devices capable of producing, storing, transmitting and utilizing information, and, in particular, giving special consideration to the study of the human and social uses of information.

These two approaches are indeed quite different at the professional level. And both appear unsatisfactory. The first one because it takes into account only one, even if the most important, aspect of the information world, i.e. documentation, and would exclude many other people who at the professional level are indeed working in the information field and in particular on the design, implementation and management of conventional or computerized information systems. The second one because it is really too broad for practical purposes.

The situation is different from a research-oriented point of view since here the problem is to permit all possible approaches and in particular a truly multi-disciplinary approach as the only way to cover all aspects of the information problem.

The preceding remarks show that the problem of finding the right place for information science with respect to the other sciences, and subsequently its place within the present-day mainly discipline-oriented university structures is a complex multi-faceted problem to be considered from a number of angles.

Following a general trend, I shall therefore divide the problem and distinguish three main areas:

- — general professional training in information science and related areas
- — training of discipline-oriented experts, specializing in the applications and implications of information science and information technologies in their specific field
- — training for research-oriented information scientists.

The discussion is limited to the training of information specialists. since the users' problems will be dealt with in the second session of the conference. The two problems however cannot be entirely separated since they are strictly complementary, which has obvious important implications for information specialists.

5. *General professional training in Information science*

As is well known there have been (and there still are) two main approaches, particularly in the U.S.A., to information science.

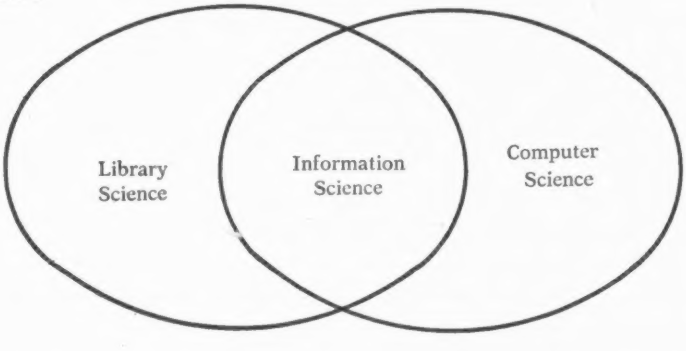
The first one is centred on library science which sometimes has been considered as encompassing information science, sometimes as included in it. The second approach is centred instead on computer science, considered as the general science of information-processing technologies and methodologies.

By recognizing the basic rôle that documentation plays in all sectors and the growing importance of automation in library administration and documentation technologies, we are led to consider these two approaches as complementary, rather than antithetic.

According to this view library science and computer science appear as two largely overlapping areas, of which the intersection may be defined as the central core of information science. We can characterize this central core as including all items concerned with the structure and properties of information-handling systems and devices.

This can be illustrated by the following diagram

DIAGRAM I



that shows that information science can be considered either as a composite discipline corresponding to the common intersection of library and computer science, or else as an independent discipline which is basic to both fields.

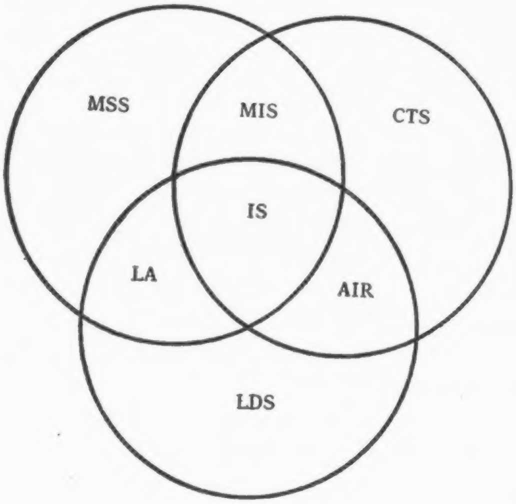
According to a more recent view a third area should be taken into consideration: i.e. management and systems science.

This is true also for two complementary reasons: first, because information analysis and information processing are basic elements of management techniques: second because, conversely, systems analysis and modern management techniques play an essential rôle in the design and the efficient operation of complex information systems including libraries, documentation centres and all sorts of computerized data banks and data processing systems.

We are thus led to consider information science, as shown in Diagram 2 as the common intersection of three large areas:

LDS: Library and documentation sciences,
CTS: Computer and telecommunication sciences,
MSS: Management and system sciences.

DIAGRAM II



According to this diagram it is possible to consider information science either as the central core possibly extended in one or more directions, or else as an option within any of the three basic constituent areas.

Although all models of this sort are of only limited value, it is interesting to note that we can give a precise interpretation to the intersections of only two of the basic constituent areas. There are three such areas, indicated in the diagram with the symbols LA, MIS, AIR and which can be interpreted as:

LA: Library administration,
MIS: Management information system,
AIR: automated Information storage and retrieval.

The preceeding discussion on the relationships between information science on the one hand and library, computer, and management sciences on the other is in close agreement with the results of the previously mentioned American investigation about the actual content of curricula in Information science, and also corresponds closely to the typical content of many well-balanced courses in information science.

This is not surprising, since the three main areas previously considered may be seen as a broad and modern coverage of the three main facets of all information systems: information content, tools and technologies, systems organization.

The preceding analysis is far from complete. It seems indeed to omit a number of factors which must be considered as basic for information science, and in particular:

1. Human and social sciences
2. Logics and linguistics
3. Mathematics and statistics.

Their absence, however, is more apparent'than real, since human and social factors are a basic component of the three main constituent areas, whereas logic and linguistics are main components for both and library and computer sciences, and finally, mathematics and statistics are basic components of management and computer sciences.

It would be difficult to over-emphasize the importance of all three factors as necessary for an adequate training for information work, since they are not simply required for background knowledge, but as basic tools for actual professional work.

The general scheme outlined here refers to a number of possible approaches to the training of variously oriented information specialists.

In particular it contains two approaches which are particularly relevant to professional training for information work: one is based on a basic curriculum in information science, the other on a curriculum in library science both of which must include a fairly extensive treatment of the following items: basic documentation techniques, planning and management of large information systems and data banks.

All the preceding possibilities have been considered here as suitable for graduate studies and training for professional work at a graduate level. But they obviously can be extended to post-graduate training.

The present scheme does not contain provisions for a specialized training in information work oriented towards a specific subject area. In principle it is possible to complete a training with additional consideration of the special problems arising in particular scientific and technical areas. A more convenient approach is, however, to acquire a basic knowledge of a specific area and to complete the required additional knowledge in information science.

This will be discussed in the next section.

6. *Training for Discipline-Oriented Information Specialists*

As previously remarked information science is not only a discipline of a composite nature, but is also basic to all other disciplines and areas of activity.

We can illustrate this by reference to the following diagram which shows information science (considered here with its three main constituents: library and documentation, computers, management and systems sciences) as an independent discipline intersecting all other disciplines, which are grouped here for convenience in five major sectors:

a. natural sciences

b. engineering

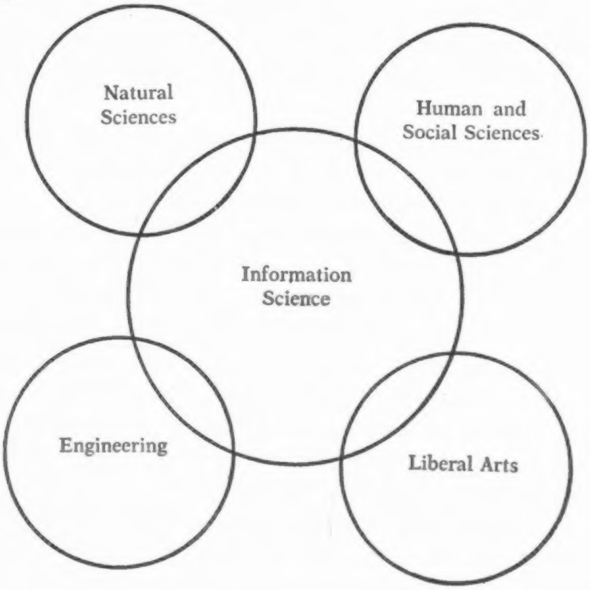
c. human and social sciences

d. liberal arts

e. information sciences.

It is interesting to note that the fifth sector is information science itself. This is so obvious that it might have been omitted, but I have deliberately introduced it here in order to stress the fact that information science technologies and methodologies are a universal element with respect to all other disciplines, including its own.

DIAGRAM III



This fact has two major consequences of a general nature:

1. that some knowledge of the basic principles of information science ought to be a part of general education at all levels;
2. that additional knowledge relevant to the specific application of information science and technology in a given subject area should form a part of education and training in that specific area.

These points have recently been stressed several times in relation with the general education in the computer area. But it applies more generally to all components of information science, i.e. it applies also to documentation and management problems which are of general interest.

A detailed discussion of these points belongs to the second session of this conference, concerning the training of users, but I have to mention these problems here because they have at least two implications for information scientists:

The first reason is that this problem today is still underestimated and it is the task of information scientists to produce further evidence on the fundamental nature of information science.

The second reason is that although users can be considered as at the remote end of an information system, the objective of an information system itself is to serve the users' needs.

It is therefore also a task of the information specialists to ensure that the information systems they are setting up have been planned to meet users' requirements and in particular facilitate their interaction with the system.

This is an important requirement, which requires in turn that information specialists are capable not only of satisfying users' explicit needs, but also of anticipating them, taking into account the users' psychology and social habits.

The preceeding remarks are all of a rather general nature and must be supplemented by some comments specifically concerning the training of « subject-oriented information specialists ».

By this term we mean people who are basically specialists in a specific discipline and need or want to specialize in the development of the application of information science methodologies.

The type of training may depend on the type of work envisaged.

This may be limited in fact to the reviewing, abstracting and indexing of documents in their own field. Or it can go as far as the responsibility for the creation of a dedicated information system or for setting up particular tools such as a theasurus or the implementation of a mechanized information retrieval system.

In all such cases the training required is a truly formal training in information sciences, of a quality similar to that described in the previous section. It should comprise a general coverage of all items belonging to the central core of information science, as well as a deeper study of a selection of topics dependent on the particular type of work intended. This is the most desirable approach, particularly for information work in science and technology.

But this approach is only possible if a post-graduate course in information science is available, since the required training has to include exactly what has been described in the previous paragraph as the central core for information science.

This is a most important remark because it is probable that in this area there exists a large demand for specialists, with adequate training that cannot be provided by short courses, which are most frequently of an introductory nature.

7. *Training for research*

Research in information science is challenging but difficult. As has been previously remarked it is practically a limitless area. It embraces, among many other subjects, an extremely varied range of topics such as:

- — philosophical or epistemological studies on the nature of knowledge,
- — formal and empirical studies concerning the syntax and semantics of natural and artificial languages, and their inter-relationships,
- — the pragmatics of natural and artificial languages, with special reference to descriptive languages, command or programming languages, conversational languages and question-answering systems,
- — artificial intelligence problems in such areas as:
    1. pattern recognition, classification of linguistic and non-linguistic information;
    2. machine handling of natural texts for analysis, abstracting, translating purposes
- — abstract and behavioural models of communication
- — generation and dissemination of scientific and factual information
- — optimum design of information systems
- — development of criteria for evaluating systems performance and analysis of the adequacy of such criteria.

The preceding list gives only a few areas of promising research. It is however absolutely essential to give a word of warning. Research in all these areas is difficult and it often requires a solid background in logic, mathematics and general scientific methodologies. Much of the research just mentioned is of a basic experimental nature: this however must not be confused with uncritical empiricism.

In a recent paper concerning basic research on the information retrieval problem J.E.L. Farradane said:

> « There is clearly a need to return to basic research; the empiricism of the last twenty years is no substitute. Accurate mathematical and statistical procedures will be necessary in research; and semantics theory must be made more exact. Above all, we must make the information problem an area of scientific study »[8].

Very similar recommendations in rather stronger terms have been recently made in a still unpublished OECD report on fundamental research in Computer Science.

That report emphasizes in particular the need for extreme caution in the area of artificial intelligence and the necessity of avoiding that, under the pressure for immediate highly rewarding results, projects are financed without any serious preliminary investigation of their feasibility. In the past, omission of this has resulted in large scale failures which have had a strong negative influence on the general development in the field.

As is well known one such case has been mechanical translation. It soon appeared clear, at least to the more competent, that syntactical analysis was insufficient. The idea that semantics would offer the solution was a rather natural second attempt. The trouble is that we had and we still have little more than a name for denoting the obscure laws which relate an expression to its meaning.

I will take this opportunity to draw attention to a problem which is of great importance in linguistic studies, but has received little consideration particularly as regards natural languages. This concerns the fact that natural languages, just as most programming languages, are complete linguistic systems capable of mixing up sentences and local meta-linguistic rules, such as definitions, local abbreviations, explanations of the intended, local meaning of certain expressions and so forth. This problem is also connected with the problem of recognizing whether in a given context a certain statement is used to define a property or a relation or else for stating that the considered relation actually is valid in a given case.

Many similar problems arise in the retrieval problem, automatic indexing and so forth, all of which eventually belong to the large area of artificial intelligence. Much progress has been made in the last years, particularly in understanding that most problems in artificial intelligence do not admit of a perfect solution. After all, also men are intelligent, at least as far as being capable of solving complex problems, if only from time to time!

This is not to say that these fields must be abandoned: on the contrary I believe that they are extremely interesting areas for basic research but not for immediate development work. Here the need is for first class human intelligence more than for money and huge teams of poorly trained researchers.

Another major research area concerns the design, analysis and evaluation of information systems. The problem of designing an optimum information system would be, at least in principle, relatively easy if one could follow straight forwardly the following procedure:

1. identify users' needs and habits
2. define an abstract functional model of the system and identify its functional components.
3. determine a concrete optimal implementation of the abstract model developed under (2).

The problem is that although much experience has been gained in practice, not only do we not know how to solve these problems, but we do not know how to formulate them exactly.

What happens in practice is that by starting from a vague formulation of users' needs and then proceeding through an iterative procedure which re-cycles the various steps the point is reached when the process (mainly guided by common sense, good judgement and much practical experience) converges with a reasonable solution.

This situation is not really exceptional and is indeed the rule for all sorts of engineering systems of some importance. A major difficulty however is encountered in this area since the preceeding process is typical in engineering and we certainly do not yet know how to handle engineering problems concerning a substance as intangible and immaterial as information.

This last remark shows the deep roots of the main difficulties of information science, since they appear as a mixture of philosophy, logic, psychology and engineering. The engineering character of information science not only concerns the 'hard' part of an information system (the so-called 'hardware') but also its 'soft' component, which besides computer programs includes all sorts of procedures and specifications all of which must be constructive, (in the sense of mathematical logic), efficient, and economical.

The present discussion does not contain direct indications on how to formulate training courses for research in information science. It is, instead, specifically directed to drawing attention to the importance of a very sound background in mathematics, systems engineering and human sciences, to basic research in this area.

Professional curricula of the various types mentioned earlier, if given at a post-graduate doctoral level are all acceptable provided they are strongly oriented towards an effective training in scientific research, and aim at training people to be as rigorous as mathematicians and as effective as engineers.

8. *Conclusions*

In the present paper, which is mainly intended as a basis for discussion, I have distinguished three main areas:

General professional training of information specialists

The training may be based on either a central core consisting of the common intersection of the three main constituent areas of information: i.e. library and documentation, computer and telecommunications, management and systems science, or as an option within any of these areas. It is essential, however for information work in the scientific and technical area, that enough library and documentation subjects be included in the curriculum.

Discipline-oriented information specialist

This type of training can be obtained by adding to a basic curriculum in information science enough training in the intended special domain. Vastly preferable is a post-graduate curriculum in information science, after graduation in a specific discipline.

Research-oriented training

No specific indications are given, except those common to the general training for professional information work. However linguistics, systems analysis equivalent to that required for research-oriented curricula in exact sciences which are mainly mathematically-oriented, and a strong background in mathematics, logics and statistics are considered essential.

Strong emphasis is also given to the engineering aspect with respect to both the hardware and the software (procedure, organization) of information systems.

No specific recommendations on the way to implement the above have been considered. It can be done in a number of ways depending on local circumstances and traditions. What is important, however, is quality and above all flexibility as regards changing the structure as needed in order to keep pace with progress and to take accumulated experience into account.

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PROF. ALFONSO CARACCIOLO DA FORINO was born at Penne (Pescara) on 18.5.1925. He took a physics degree at Turin and for some years was concerned with logical and linguistic problems in the physical and natural science fields. In 1955 he transferred to Pisa University, taking charge first of the Logics Project and then the Project for the Development of Software for the large scientific computer installed at the University. A University Lecturer (docente) since 1956, in 1966 he also qualified as a lecturer in the Theory and Application of Computers, winning in 1971 the first competition for a Chair in the same subject. Prof. Caracciolo is the Italian delegate to many international committees, in particular, at the OECD and EEC in the field of informatics and documention and presides over the EEC Group for training in informatics. He is the Vice-Chairman of the International Institute for the Management of Technology, a member of Institute's the Governing Board and the Italian Delegate to the IFIP Technical Committee on Program Languages. He has served and still serves on various national committees at the National Research Council and the Ministry of Scientific and Technical Research. He has several times been a member of the Governing Board of AICA, co-ordinator of the Working Group on program languages, and is a member of the Scientific Committee of INI.

EXCHANGE OF TRAINEES AND TRAINING PROGRAMMES

by
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The term exchange regarded here as a contract by which two parties are giving each other something is applied to the relationship trainers-traineees in the field of information science. UFOD's teaching principles are based upon a non-directive pedagogy.

This paper deals with the exchange programmes of UFOD throughout the world which are organized in France and in foreign countries around the abilities and interests of the trainees.

The discussion of the psycho-pedagogical aspects of the trainees' behaviour is developed. The need for striking a balance between the desire for producing an elite and equalizing levels of knowledge with regards to differences in mentalities, socio-cultural backgrounds, is underlined.

Nowadays, the number of individuals who wish to be trained or undergo further training is more or less identical to the exponential growth of information. One has but to read statistics concerning this matter.

In our field of information science, the problem is important because it has a close relationship with the concept of information, and indeed with its fields of application. It would be useless to attempt to explore this vast territory. Let us content ourselves with this concept of scientific information, covering specific functions such as:

— detection (gathering)
— identification
— abstracting
— dissemination
— storage of data and documents.

Let us suppose that the above outline is of interest to a sufficient number of documentalists spread over the world, and that they wish to exchange their ideas and experiences in this field.

I. *What do we mean by exchange?*

The world, no one denies it, is divided into five continents, but also into great zones. Spoken languages and dialects are many. To these spoken linguistic masses are added written linguistic masses the number of which, if not the quality, is very difficult to measure in spite of statistics relating to publishing.

The term «exchange» taken in its wider meaning: « contract by which two parties give each other something » brings to mind two concepts linked with the birth of information. It is a matter firstly of language, the fundamental medium of communication. Moreover, we are aware that this language constitutes the very basis of our profession, because in the particular meaning of « documentary language », it is a tool of mediate communication, useful between human beings and authors of documents. Secondly, there is writing. The propagation and the evolution of writing are a particular case of exchanges between peoples.

Like industrial techniques, on the one hand, and institutions on the other, writings either do or do not borrow their form or representation from each other owing to circumstances or modes of contacts. The causes of exports and imports, modes of contagion, adaptations to more or less new forms have depended on many conditions (geographical contiguities, means of transport, wars, colonization, the founding of empires, resistance movements and national renaissances, the expansion and recoil of great movements of ideas) which have expressed themselves in written texts.

This has led to the recognition of opposition between the spirit of generalization resulting from more or less coherent material conditions, and of particularisms which have subsisted or which have been created.

Thus we have supposed that all over the world the problem was the same: to subdue written linguistic masses, that is, for some people to produce information, and for other people, to process and disseminate it. This cannot be done empirically; that is why, teaching of librarianship and documentation at a national level has existed for many years. Being contained within their own borders has not seemed sufficient to the different countries who have thought that in addition to exchanges of documents, there could also well be exchanges of people leading to exchanges of ideas.

II. *Exchange of people and ideas*

1. *The birth of exchanges*

Let us take the case of our organization. *L'Union Français des Organismes de Documentation* an association created forty years ago. Since the beginning, UFOD has thought about the problem of training. The courses given were oral courses limited only to the inhabitants of Paris, or to those willing to travel to Paris. However this form of pedagogy appeared insufficient. After years of experience, UFOD decided to provide an entirely written course. The advantages of this solution (which we described recently: International Conference on Education for Scientific Information Work. FID-ASLIB, London, 3rd-7th April 1967) appeared to be:

- — possibility of transmitting an important amount of information in a relatively short time with the minimum of distortion;
- — possibility of making extensions and additions compatible with the developments of science and techniques;
- — possibility of having contacts with Parisian, provincial and French-speaking audiences in foreign countries.

This written course, constituting the raw material of the training offered by UFOD, ought to be known and disseminated. It is then through *contacts* and information networks that the principle of the *exchange of trainees* is born. It can also be said that it is born from travels made by UFOD officers, on the one hand, and from missions in France by those of documentation centres from different countries, on the other.

To date nationals of the countries listed (by continents) below have had the possibility of following the teaching dispensed by UFOD:

- — Algeria, Angola, Ivory Coast, Dahomey, Egypt, Mali, Morocco, Mauritania, Central African Republic, Senegal, Tunisia, Togo.
- — Madagascar
- — Canada, United States
- — Argentina, Brazil, Colombia, Venezuela
- — Iran, Japan, Lebanon, Cambodia
- — Federal Republic of Germany, Belgium, Spain, Greece, Hungary, Italy, the Netherlands, Poland, Romania, Czechoslovakia, Yugoslavia.

To these foreign participants, we can add officials of international organizations such as UNESCO, the European Economic Community, the International Labour Bureau, the International Institute of Telecommunications, OECD.

Exchanges are made at two levels:

- — courses given in France to foreign trainees
- — courses and seminars given by UFOD in foreign countries.

2. *Organization of exchanges*

A. *Foreign trainees coming to France.*

i. *General structure.*

Apart from the correspondence courses that a student not residing in Paris can take (teaching completed by ten-days on-the-job stay in

France, at Royaumont Abbey), the training organized by UFOD, particularly for its foreign audience, is the following:

- attendance at oral courses (evening courses);
- on-the-job-stay in a firm chosen by UFOD, completing on a practical plane what has been taught at a theoretical level;
- on-the-job-stay in firms and institutions chosen by the trainee himself, and generally corresponding to his present and future activities;
- short one-week training sessions in small groups, with case-studies, discussions, meetings;
- visits to organizations, companies etc.

ii. *Curriculum*.

The characteristic of UFOD's teaching is its « receptivity » towards other fields of knowledge we shall call « associated fields ».

Twelve years ago, UFOD, it seems, was the first school of documentation to introduce psycho-sociology in its programme. Starting from the outline of its above-cited five documentation functions it is at the first level — detection — that it has inserted the concept of « communication ». In order to study the documentalist's behaviour in groups (either a small group or a big group such as a firm), UFOD has included courses devoted to the study of different types of meetings, including practical work and case-studies. This was an example of *non-directive pedagogy*. It has been the same thing for information. It was not possible — and this we proved — to limit the teaching of documentation solely to the study of documents, their handling, processing and storing. Documentation being but the support of information, it was necessary to analyse the different aspects of information. How many schools of thought have grown up around these three concepts: communication, information, documentation! It is here that the word « exchange » again assumes its full meaning when this or that person wants to prove that communication is the medium of information or *vice-versa*. While I do not want to overload my paper with details, I should, though, like to refer to linguistics, data calculation, studied in relation to abstracting, the dissemination of ideas (through public relations, advertising, exhibitions) and ergomatics applied to documentation.

In concluding this section I want to emphasize the fact that our teaching is based on *the transfer of information on the information* we collect, acquire, and disseminate on behalf of our audience. Conventional and information aids complete these written data.

iii. *Attendance at training-courses.*

There are two kinds of students following these training courses:

Isolated attendees: who have heard of these courses and come to France on their own initiative. This is a rare occurence.

Attendees (*delegated*) sent by their governments or firms. These students generally come through the intermediary of the following organizations:

— *Association pour l'organisation des stages en France* (ASTEF)
— *Centre International des Stages* (CIS)
— *Commission Nationale pour* l'UNESCO.

These organizations take charge of the foreign students, give them grants, contact the firms or institutions likely to accept them and make their living arrangements.

B. *Courses, seminars, lectures given by UFOD in Foreign Countries.*

As I said previously the principle of these exchanges arose out of the foreign travels and missions made by UFOD leaders. Without presenting in detail the structure of the courses and seminars (a booklet gives all information about that), I should like to say that the experiments of UFOD in the matter of courses and seminars given in French in foreign countries, took place thanks to the invitation of universities, academies, chambers of commerce, national centres of scientific, technical and economic information especially in Iran, Hungary, Poland, Czechoslovakia, Yugoslavia and Canada. Two propects are presently being carried out with some American universities.

i. *Living conditions.*

The first contact that a foreign trainee has with the country he will stay in is, in most cases, the airport. We find this ordinary remark in many reports of students. It is therefore important to ensure that every student is provided with the best possible conditions for his stay, taking into account some very important factors such as: differences in mentalities, habits, climates, languages etc.

The conditions requiring the greatest care and supervision are:

— arrival and settling in
— material living conditions: lodging, relaxation, other expenses.

At this point I should like to draw the attention of governments and organizations responsible for students to this question of money, because very often the grant allocated does not really correspond to the cost of living in the country visited.

- contacts with professional circles linked to the training the student will receive;
- contacts with private circles (when it is a matter of a long stay), organization of leisure time.

Having thus presented the environment, what is the real « profile » of the trainee?

This I think can be perceived from the following elements:

ii. Aims of the training.

Position in the country.

Generally speaking the trainee works in the institution which sends him overseas.

How has the trainee been informed of the existence of such training courses in the field of technical co-operation? Did he himself decide on the organization he would like to stay in?

Aims foreseen prior to training.

The trainee generally wishes either to receive a complete theoretical training, or to procede to an exchange of ideas in some particular fields in view of a change of position or a new orientation in the activities of his own organization.

iii. *Pedagogical aspects.*

During this period of training, some pedagogical aspects are worth noting:

- organizations where the training took place
- studies and works carried out in accordance with the trainee's wishes
- difficulties encountered in work (linguistic, technical, human difficulties)
- profit from the training: on both professional and human levels.

iv. *Trainee's return to his country.*

Once back home, will it be necessary for the trainee to maintain contacts with the professional circles he worked in?

This question is very important. If the training has been positive, the answer will be positive. If it has not given the trainee what he sought, it will of course be negative.

This leads to the formulation of the problem in terms of:

input: what he receives

output: what he transmits.

At every affective, religious, professional level, exchange is practised. Why should there not be an exchange « from trainee to trainer »? In this context the experience of one of our students from Lebanon is pertinent.

After one year's training in France, this student went to the United Kingdom and to the United States. On our advice she met a professor of scientific information who advised her to go to Canada. There she met the titular head of the Town Planning Department of Montreal University. This department's laboratory team was elaborating a thesaurus of building. Returning to France, she brought with her — without realizing it — critical elements of great help to the work of French researchers, who had been quite unaware that research similar to their own was in progress in Quebec.

As a matter of fact, these input and output conditions are different for each trainee, keeping in mind differences in mentalities, sociocultural levels etc. This leads to the question as to whether, at a training level, it is a matter

— of producing an élite

— or equalizing the levels, on the principle that no one must be last.

What is needed is a differential training which avoids transmitting too advanced techniques to mentalities or institutions not yet ready to receive them. An attempt must also be made to « escape » from a too rigid framework. In fact, if during the first year courses the knowledge to be acquired is confined within the scheme of the five documentary functions mentioned earlier, we try in the second-year courses to enlarge the structures by studying the problem as a whole, rather than documentation applied to this problem: for example, political science, graphical semiology, economic and social development, futurology. Nevertheless we value a theoretical training in information, because it is the only common language that can be found for fruitful exchanges between countries and between the future managers of scientific information.

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MINIMUM INTERNATIONALLY AGREED STANDARDS IN INFORMATION TRAINING

by
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The problems of the transmission of information from the point of view of the present users' needs and conditions are analysed. The different categories of scientific information workers and their respective tasks are considered. The first group is the workers engaged in basic information activity; the second group contains all the information workers concerned with the research on information theory and techniques; the third group is represented by scientific workers. Percentages are given for these categories. The training programme at university and course levels is given with minimum requirements for subjects taught as well as numbers of teaching hours.

I. *Introduction*

At the FID/ET meeting, 21st-23rd May, 1969 at Lancut, Poland, a collective work [1] was presented, based on the analysis of curricula used in the following countries: Bulgaria, Czechoslovakia, France, the German Federal Republic, the German Democratic Republic, Great Britain, Hungary, India, Poland, the USSR, the USA and Yugoslavia [2].

The basis of these model programmes was the thesis that the major goal of modern active information is the transmission of information, in the most efficient way, from creator to user, in conformance with the user's needs.

The transmission of information with a view to the actual needs of its users requires:

a. knowledge of present and expected future needs, based upon their functions and upon the actual activities these imply (eventually upon their focus of interest). This is the decisive factor with regard to the amount of information needed.

This requirement necessitates a classification of users, first into categories and secondly into particular groups [3];

b. consideration of the level of education and of the mentality of the information users.

Supplying active information is only possible if a scientific information worker is very well acquainted with the concepts of research conducted by scientists, as well as with the plans for the development of a particular enterprise, or a particular branch of industry, i. e. with what we call « information for perspective planning ». Appropriate active information may inspire new ideas and new plans of work. Also the forms of transmission of information should be adapted to the level of education and the mentality of information users. In more extensive programmes a considerable number of lectures are dedicated to the item « users' needs ». The lectures are preceded by others on sociology, and pedagogy.

Emphasis given to information activity and to the fulfillment of the needs of users, which exerts an important influence on the remaining tasks. This involves primarily the preparation of secondary documents on the basis of primary ones. Information contained in a primary document should be selected according to the needs of a given group of users, since a piece of information which is very useful for one group may become an « information noise » to another.

A selection of information corresponding to the needs of the users necessitates the use of an appropriate information retrieval system. All such systems have their own information retrieval language, based on one of the well-known systems of classification: subject, systematic, and sometimes formal classification. The selected system of information retrieval thus determines the method (and the appliances) used for storing the processed information.

Independently of the above, a scientific information worker should be well acquainted with the storing of information sources, which he should collect on the basis of selection according to the current and anticipated demands of users.

II. *Categories of scientific information workers*

On the basis of the above-mentioned assumptions, the activity of scientific workers can be divided into three groups: the first group of functions includes:

> The selection, classification and documentational processing of primary documents; the selection and transmission of processed information according to the differentiated needs of groups of users; initiating activities connected with information within the scope of own education and of the serviced field of science or national economy.

Persons engaged in this work are called « Group A: workers in basic information activity ». They should have an academic background in a defined discipline and an additional specialization in the field of information, acquired during post-graduate studies or in basic courses, followed by advanced ones.

The number of persons in Group A which is directly engaged in providing information to the users is the largest category amounting to sixty to seventy-five per cent of all information workers.

The second group of functions includes:

> The selection of appropriate information retrieval systems and of working methods and technical media for tasks performance in specified conditions of scientific, industrial or management activities; taking into account the economic aspect; the supervision of the indexing of documents, the editing of processed information, the transmission of information by written and audio-visual methods.

These activities should be performed by specialists with an academic brackground (M. A. or M. S.) in the field of information science or library science in close collaboration with the workers of Group A. They are called « Group B: workers in basic scientific information activity ».

The number of persons belonging to Group B represents from twenty to thirty per cent of all information workers.

The third group is concerned with the research on information theory and techniques.

This work must be performed by specialists graduated in the field of information or library science and specialists from other disciplines such as logic, modern mathematics, electronic data processing, communication of information, sociology, psychology, pedagogy, etc., who have had special post-graduate training (or have completed courses) in the field of information. They constitute « Group C: the scientific workers ». Their number amounts to five to fifteen per cent of all information workers.

The particular proportions between groups A, B, and C will be largely dependent upon the degree of development of the information science and upon the organizational form of information services. Nevertheless, the core of people employed in basic information activities should be composed of specialists with an academic, directional background, supplemented by special training in information science.

For the work of groups A, B, C, the collaboration of « assistant information workers » (in some countries called « information technicians ») is of the utmost importance.

The group of assistant information workers should be composed of graduates from secondary schools, general education schools, with additional training in information either:

1. in special schools for information training, awarding the title of « information technicians », or
2. through basic courses on information.

A special category of workers are those active in auxiliary sections of the information centres, i. e. in repro-and poly-graphy, the computer service, etc. These workers should only follow a few lectures on organization and on the aims of information centres so as to be able to have a better understanding of their responsibilities.

III. *Training system.*

In practice the training of information workers exists on two levels:

— at university degree level:	*four-year under-graduate courses or M. A. degrees post-graduate courses*
	inter-disciplinary studies in information sciences
— at course level:	*basic courses*
	advanced courses

organized by various institutions such as, the central information institutions of by associations of information workers.

All model programmes cover the same main groups of subjects:

I. Theory and introduction.

II. Aim and tasks of information in different fields.

III. Problems of organisation.

IV. Studies of sources, collections.

V. Sources: handling and treatment.

VI. Systems of information retrieval.

VII. Access to documents and communication of information.

VIII. Users: categories and needs.

XI. General and auxiliary topics, selected problems of formal and mathematical logics, structural linguistics, modern mathematics, philosophy, political economy, psychology, sociology, pedagogy, technology of intellectural work.

(More detailed model programmes are given in table 1, of ref. 1).

The present paper considers the proposed Minimum Standard in Information Training to be internationally agreed upon for group A, as this is the most numerous one and because its work is directly connected with the users.

The training minimum for group A is given in the programmes of basic courses. These programmes may cover from eighty to one-hundred and five hours (an average of ninety hours), and they should be adapted to the actual state and equipment of information services, as well as to particular needs for information, in different countries.

The time limit for the teaching of each item is as follows:

1.	Introduction to the problems of information	two hrs.
2.	Organization of information services at home and abroad	four-six hrs.
3.	Organization of the work in the information centre (tasks, planning and reporting)	eight-twelve hrs.
4.	Organization of scientific and specialized libraries. Organizational structure of libraries	four-six hrs.
5.	Categories of information sources	four-six hrs.
6.	Collecting information sources	four-six hrs.
7.	Document subject processing	twelve-sixteen hrs.
8.	Scientific classification systems based on general principles of logic *	three hrs.
9.	Document indexing	sixteen-twenty hrs.
10.	Information retrieval system: manual, mechanical, automatic	eight-ten hrs.
11.	Access to information, communication and dissemination of information	four-six hrs.
12.	Propagating information activity *	two hrs.
13.	The needs of the users	three-four hrs.
14.	Archivistics *	

This programme for basic courses contains elementary knowledge of the routine information activity. What is a « routine » method depends on the level of the information science and information services in a given country. For example: retrieval in one country is founded on a store of punch cards, in another country such cards are not in common use but only the old-type documentation cards. In the first case, therefore, this matter can be taught in basic courses in the second in advanced courses. The difficulty in teaching does not depend on

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* Optional.

teaching routine methods, but in explaining what in the rôle of information in contemporary life and especially the rôle of information officers.

Detailed curricula with advice as to methodology and lists of teaching aids with a view to the actual conditions in Poland have been published in Polish [4] and in Russian.

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TRAINING OF INFORMATION SPECIALISTS IN THE USSR

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The system of training information specialists in the USSR provides for continuing education of information officers and management personnel of information services as well as researchers in the field through post-graduate courses. The All-Union Institute of Scientific and Technical Information (VINITI) is the main institution offering comprehensive facilities. The VINITI refresher courses, which include Scientific-Technical Information, Mechanization and Automation of Information Procedures, Reference Information Collection, Universal Decimal Classification and the Methodology of its Application, will be reorganized in 1972 into an Institute for the Advancement of Knowledge of Information Workers. In 1969 the People's University of Scientific Information was set up at VINITI for the training of the personnel of information centres and technical libraries. The Central Patent Refresher Institute for the Managerial Personnel, established in 1968, trains for patent information work. A special programme in Automation and Mechanization of Information Processing and Presentation was introduced at several Polytechnic Institutes.

Science-information activities are an institutionalized variety of scientific work, pursued with a view to increasing the effectiveness of research and development work, which consists in collecting, analytico-synthetic processing and storing the science information recorded in documents, as well as in providing this information to research workers and specialists whenever it is needed and in the most suitable form.

Although science-information activities have always been carried out by individual scientists and specialists, it was quite recently that they came to be institutionalized, emerging as a scientific pursuit in its own right which, however, has not yet become fully established. Also evolving is a new scientific discipline, informatics, which is concerned with the patterns and general properties of science information as well as the laws governing all communication processes, including those of science-information activities.

Among the many difficulties naturally accompanying the establishment of a new field, a major one is the shortage of professional staff.

Most of the developed countries are at present working toward creating training facilities in this field, facilities which may vary greatly from country to country. Thus getting acquainted with national practices in training for science-information activities (information officers) and for research in informatics (information scientists) will be of considerable interest in this context.

In the USSR, a system of advanced training facilities in this field has been evolving during the last few years. It provides for the continued education of practising information specialists and management personnel of information agencies through special courses, the training of engineers versed in the design and operation of information technology within the higher education system, the training of technical librarian-bibliographers at Institutes of Culture, as well as training researchers in the field of informatics through the post-graduate courses.

The success of science-information activities depends not only on the availability of well-trained professionals in the field, but also on the ability of all the researchers and practitioners to conduct a dialogue with the country's information system and on their understanding of its potentialities and proficiency in their utilization. Consequently major attention is devoted to the training of the users of science information in the country.

The All-Union Institute of Scientific and Technical Information (« VINITI ») is the main institution offering comprehensive facilities for the professional and advanced training of the country's information workers.

A refresher course for the Managerial, Engineering-Technical, and Research Personnel of Information Agencies has been established at VINITI by the decree of the USSR Council of Ministers of May 11, 1962. The course gives to the student systematic training in the theoretical and practical aspects of science information. It is open to information service personnel of all the Union Republics. By decision of the CMEA Standing Committee on Professional and Advanced Training for Scientific-Technical Information Services, information officers from the CMEA member-countries have been admitted to these courses as from 1965.

The courses offer three areas of specialization

1. Scientific-Technical Information

2. Mechanization and Automation of Information Procedures

3. Reference Information Collection.

One more speciality is being introduced - Universal Decimal Classification and the Methodology of its Application.

The Scientific-Technical Information programme includes the following:

Name of Discipline	Hours			Exams	Credits
	Total	Lectures	Practice work		
1. Scientific-Technical information: theory and organization	130	118	12	1	—
2. Mechanization and automation of information processing and retrieval	60	44	16	1	—
3. UDC and methodology of its application . . .	40	30	10	1	—
4. Small graphic arts and reprography	26	20	6	—	1
5. Essentials of editing scientific-technical literature	24	18	6	—	1
Total hours	280	230	50	3	2

The term of the course is two months.

The trainees in Mechanization and Automation of Information Procedures are acquainted with the following subjects:

Name of Discipline	Hours			Exams	Credits
	Total	Lectures	Practice work		
1. Scientific-technical information	30	30	—	—	1
2. IR systems and methods of their development . .	50	36	14	1	—
3. Computers and their application in information services	56	44	12	1	—
4. Mechanization of information processing and retrieval	42	33	9	1	—
5. Reprography and small graphic arts: methods and techniques	22	20	2	—	1
Total hours	200	163	37	3	2

The term of study is one and one-half months.

The Reference Information Collection Specialization has the Following curriculum:

Name of Discipline	Hours			Exams	Credits
	Total	Lectures	Practice work		
1. Reference information collections: organization and use	70	50	20	1	—
2. IR systems and mechanization of information retrieval	30	20	10	1	—
3. UDC and its application in scientific-technical information	24	16	8	—	1
Total hours	124	86	38	2	1

The term of study is one month.

The programme for Universal Decimal Classification and the Methodology of its Application covers the following:

Name of Discipline	Hours			Exams	Credits
	Total	Lectures	Practice work		
1. IR systems and mechanization of information retrieval	50	38	12	1	—
2. UDC and methodology of its application . . .	90	66	24	1	1
Total hours	124	104	36	2	1

The course is full-time. The minimum qualifications for admission include a higher education diploma and working experience in the field of scientific-technical information. The categories of trainees include engineering-technical and research staff of scientific, technical and economic information centres.

Programmes in all the areas of specialization envisage, in addition to lectures, practical assignments and visits to VINITI divisions and information agencies in Moscow. On completion of the course final examinations are taken. The course lectures appeared in 1969 in book form, titled *Theory and Practice of Scientific and Technical Information.*

The VINITI refresher courses are currently being expanded into a special Institute for the Advancement of Knowledge of Information Workers, which will open in 1972.

The main objectives of the Institute are:

a. to train specialists for information systems in the exact, natural, applied and social sciences;

b. to provide continued education for persons engaged in information agencies at all levels;

c. to train lecturers for the course « Sources, Retrieval and Utilization of Science Information », destined for information users.

Information bodies at all levels require subject specialists with competence in a particular area of science or industry and a special training in informatics. Such specialists are best trained at the Institute, in the programme « Information Theory and Practice »; candidates should be selected from among persons with a higher education diploma and practical experience in their particular subject area. Full-time study is six months, evening study is one and a half years, and non-resident study is two years.

It is planned that on completion of the study and after submitting his diploma paper the trainee will be granted a second professional diploma in Information Theory and Practice, qualifying him for work as an information specialist in his particular subject field.

Advanced training is planned at the Institute in the following subjects: Analytico-Synthetic Processing of Information Sources and Generation of Information Publications, Reference Services, Mechanization and Automation of Information Generation and Retrieval.

Apart from these basic specialities, special-purpose groups may be arranged to fit the special needs of those who wish to raise their professional qualifications on topics of their concern, such as UDC indexing, design of descriptor systems, etc.

The planned terms of study for all programmes are: full-time study, two months; evening study, four months; non-resident study, six months.

It is contemplated to arrange at the Institute the training of lecturers for the course on « Sources, Retrieval and Use of Scientific-Technical Information », which is addressed to the users of information. Planned terms of full-time study are two months, and evening study, four months.

In November 1969, the *People's University of Scientific Information* was inaugurated at VINITI. The student body includes the personnel of specialized information institutes, State libraries, information divisions of State Committees, ministries and other organizations in Moscow. The term of study is one year, with three or four lessons a month. The course is open to specialists with higher education. The studies are based on the curricula and programmes prepared by the University Board. The University has three faculties:

1. Informatics
2. Semiotic Foundations of Informatics
3. Reference Services.

The lecturers are highly skilled information specialists, a fact which attracts great numbers of information workers. At the end of each academic year a questionnaire survey is conducted among the students, which has enabled the University administration to bring the academic teaching of informatics closer to the practical needs of individual lower-level organizations. In compliance with students' requests, *seminars* have been held on separate topics, to exchange work experiences.

In the field of training for patent information work, of great importance is the *Central Patent Refresher Institute for the Managerial Personnel and National Economy Courses*, established in 1968. The Institute has a full-time, evening and non-resident division. There is a chair of patent information. Instruction is given in two disciplines: patent information, and forecasting. The Institute offers graduate work programmes, which include patent information.

Apart from the foregoing training facilities, large information centres and republican institutes of information regularly arrange *courses and seminars in informatics*. The subjects discussed are chosen in relation to the activities of particular information centres.

Since 1965, engineering specialists in the design and operation of information technology have been trained in this country at academic institutions by study programme 0640 - *Automation and Mechanization of Information Processing and Presentation*. This programme provides for training of « electrical engineers for mechanization and automation of information processes ». It has been introduced at the Kuibyshev Polytechnic Institute in Kuibyshev, the Tomsk Institute of Communications-Electronics and Electronic Engineering, the Sebastopol Instrument-Making Institute, the Penza Polytechnic, and the Keraganda-Polytechnic.

The core subjects within this speciality are computing techniques, automatics and telemechanics, electronics, general theory of automatic control, mathematical and engineering problems, and essentials of electrical engineering. Additional subjects cover production processes, machinery and equipment of scientific-technical information, reproduction techniques, special-purpose ancillary units and devices of information machinery, punch-card systems and electronic computers and fundamentals of scientific and technical information.

The case for the study of the fundamentals of informatics at library-bibliographic institutions is gaining widespread support. This has led to the establishment of study programme 2113 by which specialists for the « technical librarian-bibliographer » profile are trained. This programme is offered in the Moscow State Institute of Culture, the N. K. Krupskaya Leningrad State Institute of Culture, the Kharkov State Institute of Culture, the East-Siberian State Institute of Culture.

Institutes of Culture have been the first to include scientific information subjects in their curricula. The N. K. Krupskaya Leningrad State Institute of Culture initiated a separate course dealing with these matters in 1963. Early in 1967/68, a chair of scientific information was set up within the library department. The chair of scientific information holds a standing seminar in « Mechanization of Library and Bibliographic Processes ». The course in Science Information embraces science-information problems in reference to the principal areas of knowledge in the social, natural, and technical sciences. The programme is designed for training of librarian-information officers. It is structured in the professional-problem plane and covers the fundamental theoretical, methodological, and organizational problems of informatics and information supply, as well as the practical and theoretical aspects of information retrieval systems. The course offers:

1. Information as a scientific discipline
2. Organization of science-information activities
3. Methods of information service
4. Information retrieval systems.

In the Moscow State-Institute of Culture, information courses were initiated in 1967, and the chair of scientific information was established in 1969. The Scientific and Technical Information course syllabus includes the following subjects:

1. Subject and method of scientific-technical information
2. Documentary sources of science information
3. Analytico-synthetic processing of documents
4. Typology of information retrieval languages
5. Classification-type information retrieval languages
6. Descriptor-type information retrieval languages
7. Special-type information retrieval languages
8. Information retrieval systems: general concepts
9. Simpler mechanized IR systems using manually punched cards
10. Mechanized information retrieval systems
11. Automated information retrieval systems
12. Organization of scientific-technical information in the USSR and abroad.

Research personnel in the field of informatics are trained through full-time and part-time post-graduate courses at VINITI.

The post-graduate course programme was developed in 1959. Guidance for graduate students is provided by the leading specialists of the VINITI and other scientific institutions. Among the faculty are twenty-three Doctors of Science, of which thirteen Professors and Doctors are on the staff of VINITI, and thirty-two Candidates of Science, of which ten persons have completed the VINITI graduate programme. In working for his thesis the student conducts a research study of topical interest, the results of which are applied by VINITI and other information agencies in this country.

Post-graduate students are specialized in any one of the three areas:

1. Scientific and technical information
2. Computing techniques
3. Structural, applied and mathematical linguistics.

Being a leading institution in the field, VINITI devotes a great deal of attention to the training of research workers for the Union Republics, ministries and specialized institutes through « assigned » graduate programmes. All full-time post-graduate students are attached to scientific groups at VINITI to do research and to contribute to their scientific endeavours.

On VINITI's initiative, several academic institutions in this country have introduced the optional discipline « Sources, Retrieval and Use of Science Information », which gives their graduates a certain minimum of knowledge in the field of scientific-technical information.

The first such course began in the *M. V. Lomonosov Moscow State University* in the 1963/64 academic year. It is currently offered as a twenty-four hour programme in the physics, chemistry, biology-soil sciences, geology, and geography departments, as well as the department of cybernetics and computing techniques. The curriculum content is as follows:

1. Science-information activities
2. Scientific literature
3. Science-information and bibliographic publications
4. Science-information agencies and special libraries
5. Information retrieval: basic principles
6. Conventional information retrieval systems
7. Descriptor-type information retrieval systems
8. Information retrieval hardware
9. Document copying
10. Utilization of science information.

A manual based on this course has been written, and the International Federation for Documentation plans to publish it in English.

The chair of science information at the M. V. Lomonosov Moscow State University launches a pilot scheme for the training of information specialists in the 1972 academic year.

This paper does not pretend to be comprehensive coverage of this problem area and cites the basic data only. These are indicative of the great significance attached in the USSR to the education and training of information specialists, which are evolving on the basis of the higher education system. The emerging system of training for science-information work needs further elaboration, which is envisaged by the State five-year plan for 1971-1975.

Prof. Alexander Ivanovich Mikhailov was born in 1905. He is a doctor of Technical sciences, the Director of the All-Union Institute of Scientific and Technical Information (VINITI) of the Academy of Sciences of the USSR, Vice President of FID and Chairman of the FID Study Committee on the theoretical Basis of Information. He is the author of over 70 scientific papers.

SESSION I

Training of Information Specialists

SUBMITTED PAPERS

TOWARDS A NATIONAL PLAN IN APPLIED EDUCATION AND TRAINING

by
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Manchester

This paper describes the activities of the National Computing Centre in computer education. A system for the training of systems analysts has been developed which provides complete training for the analyst at all levels in his career. The technique used has been the creation of packages.

The need to provide computer education in the schools was recognized in 1968 and the package developed is now widely used in the 17 plus age group in U.K. schools. A three tier system has been developed to provide computer appreciation courses for the management of U.K. industry.

The package approach, while not being put forward as the only way of improving knowledge has been shown to be based on sound principles that work.

The United Kingdom computer market is growing at a rate of between thirty and forty per cent. This growth is not unique to the United Kingdom but presently the existence of the National Computing Centre and its influence on computer education is unique.

The National Computing Centre Limited (NCC) was established by the Government as a non-profit distributing organization in June 1966. Its income comes partly from Government sources and partly from the sale of its services or products, or from membership fees. These members represent computer manufacturers, consultants, users (State, local authorities, and private firms), and account for some sixty per cent of the country's computing power. This constitution enables NCC to act as a useful link between Government and industry. The objectives of the NCC can be paraphrased as being to extend and improve the use of computers in the United Kingdom. More specifically this is achieved through co-ordinating existing activities, acting as initiator and catalyst in the development of new techniques, disseminating information and the best practices and procedures and by providing advice, information and educational services. Even now, August 1971, it is still a comparatively small organization employing about two hundred including secretarial staff, but because of its unique position it is a significant influence on business, commerce and industry in the U. K. and is beginning to have an impact on Europe. From its inception, education has been recognized as being of tremendous importance, and this paper describes some of this work, both in the training of information specialists and the education of information users.

Systems Analysis Training

The NCC first made an impact in the U. K. in the field of systems analysis training as a result of the recommendations produced by the systems analysis working party in June 1967 *. This report pointed to a considerable shortfall in the supply of systems analysts, and proposed that a national plan for systems analysis training should be established in the U. K. The NCC was asked to convert this national plan into a reality.

Diagrammatically the plan took the following form:

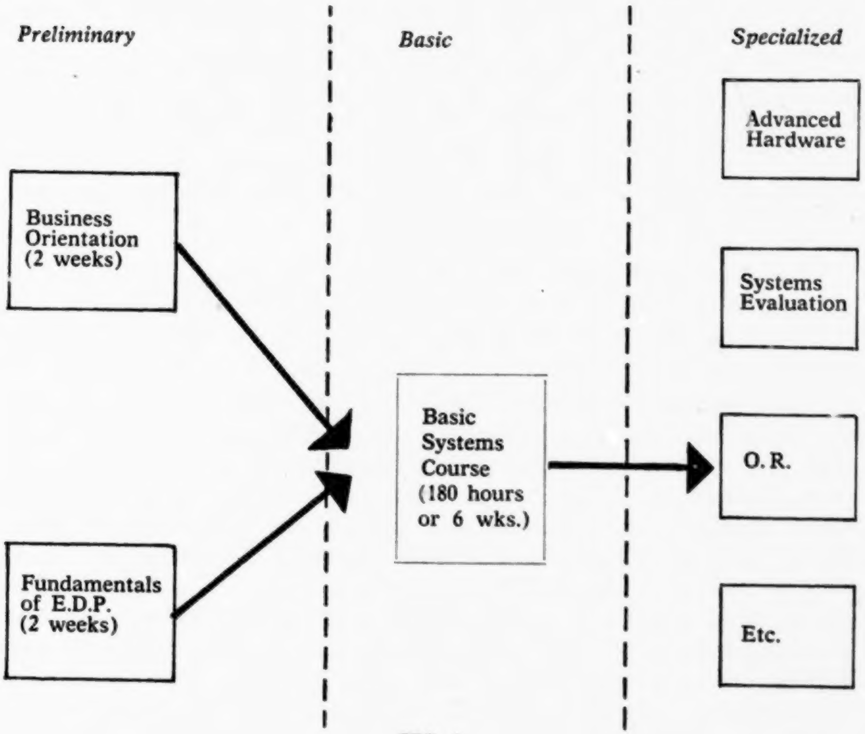
Preliminary
Basic
Specialized
Business Orientation (2 weeks)
Fundamentals of E.D.P. (2 weeks)
Basic Systems Course (180 hours or 6 wks.)
Advanced Hardware
Systems Evaluation
O. R.
Etc.

FIG. 1

The method used successfully in achieving this objective was the creation of a packaged course. The first package was produced for the basic training of systems analysts and was designed to cover a course of six weeks or 180 hours. The package consists of a tutor's guide, student notes and visuals and attempts to eliminate the inevitable development in the preparation of any course. The experienced teacher is able with a minimum of preparation to present an integrated and tested course. It was anticipated that this first package would sell only in the U. K. and that the total market was likely to be about thirty packages.

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* Systems Analysis & Design Working Party Report (NCC).

In the event, this figure proved to be a considerable underestimate of the U. K. market and failed to recognize the large potential that existed overseas. The first edition of the package was very quickly taken up and replaced by an up-dated and more sophisticated package which is known as the Mark II. To date the basic packages are being used by over one hundred companies and colleges in the U. K., and more than one hundred are in use in some thirty countries outside the U. K. The interest that has been aroused in the development has been almost world wide and has been shown at the various international computer conferences which have been attended by NCC staff. Currently a Mark III package is being prepared which will again up-date the material already available.

The users of the U. K. package fall into two categories, namely Colleges and Industry, including computer manufacturers. The original conception of a six-week full-time course is still felt to be the ideal, but in practice the course is now run in many guises on a full and part-time basis. Overseas, the users are either in education or industry and include such international agencies as the International Labour Organization.

As soon as the basic package had been created, steps were taken to develop the other elements of the national plan. Representative working parties consisting of members of industry, education and NCC were set up to develop syllabuses covering the preliminary modules and two packages covering Business Orientation and the Fundamentals of EDP were produced. These packages were designed to answer the need for computer staff who lacked business experience or systems staff who were lacking in computing knowledge. As for the basic systems analysis package, this material is now being offered either to technical colleges or to firms for the training of their junior analysts and is not taught by NCC staff.

Before starting to develop the specialized courses, it was found necessary to add to the national plan. The basic course for the training of systems analysts was aimed at « would-be » systems analysts with some business and computing experience. In practice a number of systems analysts were already active who had not had the benefit of any coherent training. It was found necessary to develop a four-week intermediate course in systems analysis and design which was aimed at the analyst who had really learned by experience. This course, which it was intended should be run over a limited period for members of NCC only, is now in its third series and is run entirely by NCC staff on a four-week residential basis. In this sense the intermediate differs from the preliminary and basic courses which though developed and tested are not run by NCC staff, (our rôle in these instances being to establish and maintain standards). The latest development is to package this material and to make it available to organizations in the U. K. for use « in-house ». Already one member company is using it for the training of its analysts having seconded a member of its staff to NCC to help in development.

The final stage of the national plan has been the creation of the specialized course modules. These deal with such concepts as advanced hardware and software, systems evaluation, operational research etc. and the courses vary between one and two weeks in duration. So far we have developed and successfully tested four modules and aim either to run these courses ourselves or to make them available through agents who will in all probability be the management consultants of the U. K.

The present situation in terms of systems training in the U. K. is that the national plan is now almost achieved. Packages are now available and being extensively used for all three levels of systems analysis training and in addition an intermediate level has been introduced. The basic systems analysis course is still further supported by an arrangement between NCC and the British Computer Society. The British Computing Society which is the professional organization of computing specialists in the U. K., has co-operated with the NCC in the establishment of a national certificate in systems analysis. To date some 1700 students have successfully completed a course which is nationally recognized and plans are currently being developed to establish a higher certificate in systems analysis based upon the advanced modules of systems analysis. The basic certificate is also now awarded in some other countries under arrangements by the NCC and BCS. The certificate gives some recognition of a student's achievement, in that he is examined by both internal and external examinees, and in addition to a written paper is assessed as to personality and must pass a severe *viva voce*. Furthermore, the activities of the external examining panel do go some way towards the establishment of a National Standard of course presentation.

Schools Education

Early in 1968, a need was recognized by the NCC to establish some form of data processing education in secondary schools. Plans were drawn up and implemented which have led to the development of a package that can be used by teachers of seventeen-plus students at school. The title of this project is « Computing - Its Impact on Business and Society » and the title aptly describes its objectives. In the U. K. there are approximately 6500 secondary schools. The NCC with the co-operation of its member organizations has developed material which enables these schools to show the impact of computers on the lives of the schoolchildren and upon their future careers. Because of its unique constitution, the NCC has been able to tackle this problem without regard for the commercial aspects of the scheme but simply from the viewpoint of national interest. Through the cooperation of schools, Local Education Authorities, member firms (both public and private), and Government Departments, NCC has been able to develop and test a scheme for extending computer education in schools. A package has been produced which is available to the schools at minimum cost. This is only possible because NCC is not a completely profit-oriented organization and cash which is earned in other projects can be used in schemes like school education. So far the package is being used by 165 schools and it is hoped to increase this number to cover all the secondary schools in the U. K. within the next ten years. Once again considerable interest has been created overseas regarding the possibility of the use of this package.

Management Education

Yet another field of activity during the last two years has been the development of computer appreciation courses for management. The NCC has collaborated very closely with the Engineering Industries Training Board in the development of a series of courses for management. The EITB was set up under the Industrial Training Act of 1964 which had the main objective of providing an increase in trained manpower to improve training standards and to achieve a fair distribution of training costs. The Boards, of which there are now twenty-nine, have the power to establish a training levy which is collected from employers, and to determine how their training grant system should operate.

In December 1968, a lengthy period of collaboration began between the EITB and the NCC. NCC was asked to convert the proposals of a joint committee representing training boards of computer manufacturers and further education into a practicable series of courses. The result was the creation of a:

one-day course for Chief Executives
three-day course for Functional Directors
five-day course for Senior Managers
The last two courses are fully residential.

In the period between January 1969 and May 1970, the NCC ran a series of five one-day courses, ten three-day couses and twenty five-day courses. By the end of 1970 this has been increased to a further five one-day, ten three-day and twenty five-day courses.

The basic objectives of these courses were:

1. to dispel the mystique associated with computer equipment and staffing,
2. to define the rôle and degree of involvement of all levels of management in the planning and control of computer projects,
3. to emphasize the importance of training and education for both computer and departmental staff.

The emphasis throughout is on the importance of management's contribution and the need to exercise very strict project control over the introduction or extension of computer usage (see figure 2).

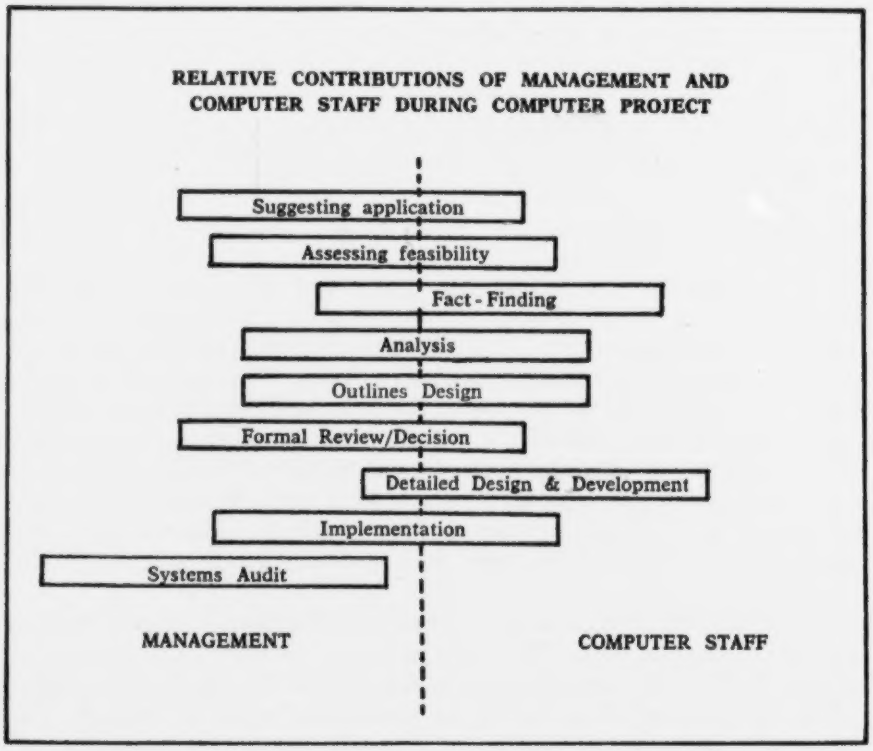
RELATIVE CONTRIBUTIONS OF MANAGEMENT AND COMPUTER STAFF DURING COMPUTER PROJECT
Suggesting application
Assessing feasibility
Fact - Finding
Analysis
Outlines Design
Formal Review/Decision
Detailed Design & Development
Implementation
Systems Audit
MANAGEMENT
COMPUTER STAFF

FIG. 2

The success of these courses is very apparent. There have been many examples of members of the same company attending successive courses, and as a result of the co-operation with EITB, in-company courses have subsequently developed. Currently the EITB is carrying out a survey to establish the long term effects, if any, of attending this type of course.

To date over one thousand Directors and Senior Managers have attended, so that considerable experience has been gained in organizing and running this type of course. Using the experience in connexion with the systems analysis training and schools education, the Functional Director's Course, and the five-day Senior Manager's Course, have been packaged.

The objective in the latter case is to persuade carefully selected Agents to take over the task of running the courses, using the material and techniques which have been developed. The agents are very carefully vetted as to the suitability of their individual staff etc., and the material is only leased to them for a limited period. In the event of a decline in standards the agency will be withdrawn.

The establishment of Agencies, and the consequent shedding of teaching load is proving rather difficult in that Agencies have problems of obtaining competent teachers and establishing a good reputation. The problem of teachers is always with us, but is an area on which NCC is increasingly concentrating. During the next twelve months, courses are being organized for would-be teachers, and it is hoped to encourage secondments to NCC for development and training purposes.

An alternative approach is by encouraging in-company courses. As a result of the reputation established during the EITB series, requests are being received to establish and run courses for individual companies. As the material is of general application, it has been possible to satisfy these demands without too much modification. If the company is large enough, it is encouraged to take over the running of the course itself, but once again there have been difficulties in finding suitable teaching staff within client organizations.

The package for the Functional Director level course is only as yet in limited use by agents and ourselves outside the EITB series. However, in conjunction with the material for the Senior Management Course, it is proving extremely useful when creating in-house courses.

As with the developments in systems analysis education, it has been found that considerable interest exists in using the management material overseas. Already there is an agency operating in Belgium that runs the NCC five-day management course and many enquiries have been received throughout Europe regarding the possibility of using this material.

Results Within the United Kingdom

The result of this activity in the UK has been the creation of schemes of computer education which are based on sound practical principles. The NCC fulfils a unique rôle and is able to produce courses and material which are sound educationally and yet are based upon practical experience, through the co-operation of its members both industrial and academic. It has proved possible to produce packages which can train systems analysts, give managers a basic appreciation and yet can be used by competent teachers in industry and colleges. It is not claimed that this is the only solution of the problem of computer education, but it is a solution which produces almost immediate and very valuable results by the efficient use of limited resources.

JOHN ADDERLEY is a Senior Consultant in the Applied Education and Training Department of the National Computing Centre of the United Kingdom. Currently his responsibilities include the initiation and development of computer education throughout the U. K. particularly in the fields of systems analysis and management appreciation of computers. Prior to joining NCC in 1968, he had experience in higher education and management services in British industry. A speaker at the I.F.I.P. World Conference on Computer Education in Amsterdam in 1970, and the I.A.G. Conference on Systems Change in Frankfurt in 1971, he has had several articles published in the U.K. and the U.S.

CRITERIA AND EDUCATIONAL TOOLS IN THE TRAINING OF PROGRAMMERS

by
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Ing. C. Olivetti S.p.A.,
Ivrea

The author in considering the training of EDP specialists explores didactic methods, rather than content, in the teaching of program languages. The author rejects the method which begins from a close examination of the individual elements of the language and suggests that it must be taught as a natural language. The overview of the language must be present before its elements are analysed. These elements will emerge as the student works to solve the real problems of the program and comes in contact with the computer. The continuous man-machine interaction encourages an interest in learning, reinforces the information which is acquired, and lays down the premises for the development of creative activity.

Premise

In discussing training in informatics the accent is very often placed on the content rather than the methods; on that which is taught rather than the way in which it is taught.

It is said that the EDP specialist is a professional of a high technical level and that he who trains these specialists must be capable of transmitting this high degree of technical competence. The didactic discussion while useful is certainly a secondary factor.

Personally I am very far from convinced of this point of view. Indeed I am sure that many of the difficulties encountered in the training of new EDP professionals lies in the lack of good teachers. There is no shortage of persons who « know », but there are very few who are capable of teaching what they know.

It is not merely a question of content but also of methods. Indeed at the level of initial training what counts is not so much *knowing* but *knowing how to teach.*

I. *The analytical and the global methods*

The global method which has so clearly demonstrated its excellence in the teaching of natural languages, is not so well considered in the teaching of programming languages in the informatics fields.

Indeed it can be said that the traditional analytical method still goes unchallenged.

Let us, for example, have a look at the way in which a programming course is normally organized and what are the didactic criteria behind its development. There are three fundamental and clearly distinct subjects to be taught. Hence the course is structured according to the following three modules:

1. introduction to EDP, covering general concepts of automatic data processing: information theory, elements of Boolean algebra, numeration systems, the structure and functional logic of the computer, the organizatoin of data on supports, etc.;

2. introduction to programming, concentrating essentially on flowcharting;

3. programming language.

Two characteristic aspects are to be noted in this type of structure. The first is the fact that pupil comes into contact with programming (module 2) only after a full survey of the introductory concepts (module 1), which up to this point necessarily remain very abstract. The second is that the flowchart and the language which are the inseparable elements of programming, are taught at separate times. In other words, the pupil must have completed the flowcharting aspect prior to any instruction in the programming language, which will enable him to create an individual flowchart.

Let us now see how the teaching of a programming language is tackled. We shall suppose that COBOL (Common Business-Oriented Language) is to be taught.

A start is made with the general rules: programming module, admitted and unadmitted symbols, the length of names, reserved words, programmer's words, punctuation, etc. Great emphasis is also placed on definitions: for example the concepts of division, section, paragraph, sentence or phrase or the concepts of flow, records, compounded and elementary data.

The survey of the rules and general concepts is followed by a second stage in which the analysis of the elements of the language, division by division and section by section is studied. Since a programming language, unlike a natural one, is a strictly codified language, it is essential that the format of every phrase and the meaning of each item is clarified extremely well.

Stress is also laid on the analysis of programming rules (for instance, the many rules governing the use of symbols in the « PICTURE » and the complex case history of the verb « MOVE ».

Once all the elements of the language have been described, through a difficult work of synthesis, these are then presented in a general framework and the pupils at last reach the stage of realizing their first program.

A certain pointer which tells us the degree of application of this method, is given when the pupil is capable of writing unaided his first complete program: the longer the period that elaspes between the beginning of the course and the latter stage, the more radical is the application of analytical method.

The global method, on the contrary, is based on an entirely different approach. Its objective is to bring the pupil as soon as possible to the writing of his own program.

The course begins with a very general presentation of the structure and the functional scheme of a computer and touches very broadly on the organization of data on supports. For instance, it can be said that half a day is sufficient to impart this first introductory survey. The pupils are then introduced immediately to the flowchart. The ideal is achieved when the pupil draws-up his own flowchart from the very first day. Naturally at this point the entire subject of flowcharting cannot be dealt with, but when the pupil has acquired a certain familiarity with very simple flowcharts, he is immediately introduced to the programming language. The more extensive study of the introductory concepts and flowcharting techniques will take place gradually together with progress in the knowledge of the language.

The approach to the language is as follows: a start is made by the writing of a simple, brief but complete program, in such a way that the pupil immediately acquires an overall understanding, even if fundamentally intuitive, of the language.

This first program will be written by the teacher together with the pupils; that is to say, in practice, the former will suggest and explain it to the pupils.

At this point a natural objection arises: how is it possible to write an entire program without having illustrated a single language rule? The answer is very simple: let us recall how we learnt our native language; by repeating words and phrases that were spoken to us, intuitively associating the words with the things and certainly not by studying grammatical rules. Let us also recall the fact that this is the best way of teaching adults a second language. Why then should this not be a valid way of learning a programming language?

Hence the essential point of the global method is this: we first of all become familiar with the the whole and then the individual parts are analysed, first the language is learned and then it is perfected by studying the rules.

If this process is reversed, if a beginning is made on the individual parts to arrive afterwards at the whole, if the rules are studied before using the language, the pupils are forced to make a great mental effort to apply concepts concerning which they do not know the final meaning.

It is, on the contrary, important that the pupil should immediately achieve his own program, in such a way as really to grasp the global structure of the language. It is of no importance if this first effort of his contains some error of punctuation or does not use the programming module in an entirely appropriate way. Starting from this overall comprehension, it will subsequently be possible to study the single elements in depth without ever loosing sight of the whole. Every time the pupil studies a new particular he will always know how to set it within the general framework.

The global and the analytical methods, therefore start from different didactic principles and develop along entirely separate and distinct lines.

Let us attempt a comparative synthesis.

The analytical method is based on the following principles:

1. practically integrated but logically distinct elements of a single technique (for example, flowcharting and the language, the single divisions of the language, the single sections within the sphere of a division), for motives of clarity and completeness are studied separately.
2. From an in-depth analysis of the individual elements the pupil is brought to an overall comprehension.

The principles of the global method, on the other hand, are:

1. The various elements of the program, even if they are logically distinct are taught as a whole.
2. Learning is realised through a spiral process composed of three fundamental phases: the intuitive understanding of the whole, the analysis of the individual parts, the rational re-comprehension of the individual parts in the whole.

II. *The use of the computer in the learning process*

Independently of the method adopted, the opinion that it is possible to teach programming without any direct access to a computer is certainly true.

Computer logic, in fact, can neither be departed from nor does it present ambiguities. By starting from a correct flowchart and a precice knowledge of the working of every individual instruction, it is certainly possible to write a perfectly correct program or, at least, all the instruments are available for carrying out a careful verification at purely theoretical level.

When this check has been made, the program must work; if this does not take place, it is due to an accidental factor, some error in transcription, or it can mean that the checking was not sufficiently strict.

In the first case the computer itself capable of indicating the error and suggesting the correction, in the second case, on the other hand, this is possible only if the error is of a formal kind; if, on the contrary, there is a logical error more careful and strict re-checking is needed.

In either case, a good teacher, with the aid of good text books, could teach a certain programming system without ever introducing the pupil to direct contact with the computer. In the three successive stages: lesson, drill, correction, the pupil should be capable first of learning the programming rules, then experimenting with their application and lastly checking the correctness of his work and his degree of learning. When a certain program has been corrected by teacher together with all the other pupils it should no longer be thought that it could contain errors. The teacher's correction will therefore have the same value as a test in the computer.

It cannot be denied that all this is true and that the method generally adopted in the various programing schools is very close to the one described here. Contact with the computer, in fact, both for reasons of availability, and didactic difficulties, is very often reduced to the minimum.

However such a method creates notable difficulties in the learning process. The lack of a continuous interaction with the computer gives the pupil the impression that instead of learning how to use a machine he is working on mere abstractions. He is first frustrated in his natural desire for a practical and effective check of his work, he is less certain of what he learns and the stimulus to learn new ideas is weakened. The use of a computer during the learning process has, above all, a very strong psychological effect.

I consider that three fundamental diadactic objectives can be achieved through direct contact with the computer: to encourage an interest in learning, to strengthen facts already learnt and provide the opportunity of carrying out creative work.

2.1. *The computer as a promotor of interest*

In the teaching of programming the introductory part is always very difficult and is justifiably given very special attention. I have experimented with the traditional method based on the two distinct modules described above: introduction to EDP and flowcharting. I found that this posed considerable didactic difficulties because the first part was so abstract and unstimulating.

Turning to the global approach, I decided to start the course with a practical demonstration of work carried out by a computer. A very simple and easily understandable procedure was chosen (invoicing with the updating of warehouse stocks), realized on a small card computer system, Each pupil was able to see the performance of all the individual operations and was also able to take part in the carrying out of the programme by introducing data or asking for certain results.

At the end of the demonstration a very great interesting in knowing the structure and the working of the computer has always been shown. All the introductory concepts could be clarified in a most effective and very quick way because it was always possible to refer to things already known and not mere abstractions. But after this first experience the pupils immediately begin to want to have a different contact with computer; no longer in the sense of seeing and understanding what it can do, but in the sense of making it do something. That is to say, the pupil wants to see if he is capable of commanding the machine. For this he needs to learn how to program as soon as possible. The analytical method tends to defer too long this second and most significant contact with the computer. The global method, on the contrary, enables this objectives to be reached quickly and easily.

2.2. *The computer as a verification instrument.*

The pupil that has been capable of writing his first program, the instrument for the domination of the machine, wants to test its effective validity. As long has he has been unable to effect a test of this kind, he cannot proceed to other programs with adequate certainty. It is extremely important the the first test does not become a frustrating factor, due to banal difficulties of an organizational character or for operational errors. At the outset it is wise to employ very simple exercises, with pre-arranged check data. Where possible, also as regards the program, it is very useful to employ pre-punched cards. The compilers' diagnosis unfortunately is neither always very clear nor a help in locating an error. This is one of the main difficulties in the way of an easy dialogue with the computer. When the pupil has got through the first test and has acquired the fundamental elements of the programming language, he is ready for more independent learning.

2.3. *The computer as a means of creative activity*

At this point the computer no longer serves to check the accuracy of certain ideas acquired theoretically, but for performing a creative activity. This is the moment when the pupil passes from the lesson-drill-testing didactic phase to a much more autonomous phase. It is therefore a question of assigning to each pupil, or rather groups of pupils an exercise of a certain entity, which involves not only the writing of the program but the carrying through of a complete procedure, albeit it simple.

In this way the pupil is able to grasp not only the working of an individual program but the concatenation of several programs and must necessarily arrive at a wide use of the system's software. It is of no importance if all the instruments that he must use have been previously explained at theoretical level. The purpose of the exercise is, in fact, that the pupil is brought realize the need for certain instruments, which he discovers for himself and learns to use. The teacher at this point does not disappear but assumes the rôle of suggester and consultant.

Dr. Mario Bellardinelli, born at Ancona on 2nd February 1938, he took his degree in Political Science at Rome University in 1961 with a thesis on the Hisotry of the Political Parties and Movements. In 1963 he joined Olivetti as an electronic programmer, and subsequently was concerned with documentation in the field of basic software. From 1971 at the GEISI he was first responsible for the training of clients' personnel and then the training of internal staff. In 1971 he returned to Olivetti and is currently responsible for the formation of the administrative sector and the information systems.

THE PRESENT DAY PROBLEMS OF TRAINING LIBRARIANS

by
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Civic Libraries and Collections,
Turin

Personal and creative work in the field of information, communication and retrieval, is now chiefly an American task. Italy is in a disadvantageous position because of the poor standard of conventional library schools in Universities. An interest in librarianship and bibliography is needed for the professional training of librarians and for the firm grounding of the newly established schools of informatics at the Universities of Pisa and Turin and the proposed school for the training of librarians and archivists at the University of Genoa.

European and, in particular, Italian inferiority and backwardness, compared to the United States, in every aspect of the science of information can perhaps be seen most clearly in the lack of adequately trained, or even adequately briefed, staff. This inferiority even affects the rate of development of physical installations, in that it can prove the most serious obstacle to their complete utilization.

This is not due to a technological gap so much as to a difference in cultural level between the United States and Europe. It is difficult to discover the causes which created, and now threaten to perpetuate and aggravate the situation, particularly in our country. This can be observed in the problems the new science (or technique) has to face, how long it took to identify them and the way in which they were then dealt with.

The information explosion, which is behind our difficulties, was to be expected in the second half of the twentieth century. Its roots are found in every extension of the instruments for the communication of thought, in every phase of human history, whenever the speed of technological and social development has been such that both instruments and possibilities of transmission could be rapidly increased. As a consequence the messages to be transmitted have greater variety, significance and influence on contemporary reality, and require, therefore, diffusion on a larger, more rapid and efficient scale, thus creating a succession of actions and reactions at an always giddier speed, at least until a new equilibrium is found. This was the case in Renaissance Europe, when the practical application of certain modest but ingenious innovations in the field of metallurgy brought about, for example, the introduction of movable type. The industrial revolution created a similar situation, under circumstances closer to our own, when radical economic and demographic changes enabled Gutenberg's invention to be mass produced.

The explosion of information connected with the two cycles mentioned above, and possibly also analogous phenomena further away from the present, brought about problems whose nature was similar to our own even if the dimensions were different, problems that came to be identified and eventually resolved, possibly at first in a provisional way through practical compromise. The descriptions and classifications provided by bibliographies, particularly from the nineteenth century, which were reflections of social and cultural developments brought about by the industrial revolution in the Anglo-Saxon countries, have shown how these problems were resolved. Fundamental principles for obtaining information are still based on procedures worked out at that time, the more complicated and sophisticated instruments we now use have no more intrinsic significance than the substitution of steam with other sources of energy.

The cause of the cultural backwardness in Europe, in particular in continental Europe, as compared with the United States, which is, as has already been said, more serious than the technological gap, can be found in the more rational and efficient organization of bibliographical information, which had already started in the last quarter of the nineteenth and early part of this century. One of the most important aspects of this development was the schools for librarians at university level, unknown to the old continent, also the decimal classification and the provision of index cards, started in the early part of the twentieth century by the Library of Congress, which made it possible for the network of services to spread and be adapted to meet the needs of a technological society in a period of expansion and rapid change. As a result of these schools the science of the organization of knowledge was established.

This type of university school was linked to the increased demand for library and documentary services, connected in turn with technological and educational developments occuring in every industrially advanced country; its influence was felt more slowly, however, and encountered greater obstacles, on the continent of Europe. This has also been the case with libraries organized according to modern criteria, which have been accepted with many reservations, if not rejected outright, where there was the influence of an older tradition, or a considerable collection built up in another era according to different criteria. The obstacles have been particularly great in Italy, because our cultural organization has been insensitive to requirements considered to be purely bibliographical and documentary.

Therefore the only background that was required was a general and, on the whole, watered-down humanism; at most some experience in palaeography was considered desirable for the handling of codexes, almost as though to emphasize the similarity between libraries and archives, in particular our very ancient (and very rich) historical archives. What little teaching has been sporadically given on bibliographical subjects in our literary faculties has been based on these assumptions, even the specialized Schools for training post-graduate students in library and archive work have been a failure, both from the point of view of the efficiency of the teaching, and as contributions to research, which should be considered equally important in a field where new problems are constantly arising and where a radical transformation is being carried through.

I have spoken of research, and of original contributions to bibliographical information, not because of a mania for perfectionism, or a snobbish desire to contribute some new thought to techniques we have received on the rebound, such as automatic information. We are now beginning to realize that all our techniques for handling information depend in large part on the concepts and experiments worked out by Andrea Crestadoro and Charles Ammi Cutter, bibliographers who, in the second half of the last century, tackled the problem of the mass of constantly increasing publications facing readers.

Documentary material is being distributed through a system which has now reached its third generation, according to techniques worked out under conditions different from our own, for different purposes, that is, for the compilation of indexes and bibliographical catalogues. The fact that these techniques still serve us proves the validity of the theoretical principles behind them, to which reference was made, possibly unconsciously, by their authors; however, we should not forget that those techniques were simple and provisional arrangements, almost practical compromises, to make up for deficiencies of traditional methods no longer able to handle the vastly increased literary output. Faced with the twentieth century explosion, on an even larger scale, of every form of communication, we have limited ourselves to applying those same techniques to ever more rapid instruments, we have done nothing to re-investigate the fundamental principles in order to test their validity in the face of new conditions, or find principles of renewal within them, or rediscover other principles now considered obsolete which might still give good service - as was found by Andrea Crestadoro.

This research into and rediscovery of the uncertain principles, which lie behind the science of information, cannot be undertaken exclusively within the bibliographical and documentary disciplines which are gradually penetrating our university institutions, so that in our country there will in future be training at a professional level. Such schemes, still at an early stage, are intended to satisfy the requirements of library and documentary services in a modern society, they are now supported by degree courses in the faculties of literature, which have traditionally provided the greater part of the staff for these services. However there should be some collaboration with the faculties of science, who have analogous degree courses in the science of information, for example research could be jointly undertaken and, possibly, certain other functions, such as the organization of extramural courses.

This invitation to the « two cultures » to collaborate may seem strange, or at any rate inopportune at a time when our higher instruction is expanding and being reorganized, when these changes are leading, perhaps inevitably, to greater fragmentation and isolation of the various disciplines. But the perplexity will disappear if one remembers that there is a common root to the two possible ways for recording documents, whether the system be manual or automatic. Analysis of the contents, that is the ancient genealogy of systems of classification (without excluding problems connected with alphabetical classification) on the one hand and, on the other, the formal presentation of the document, that is the method of cataloguing it (whether according to author, title or key word does not matter), which only reached its full expansion in the era of print: the necessary and complete identification with the logical principles worked out in the fourth century B.C., when the science of nature and science of man were one, also the inevitable call to reflect on the possibilities and limits of logic itself as formulated by the mathematicians of this century.

It is only on this basis, making use of these intellectual instruments, that it will be possible to identify and limit the drawbacks and deficiencies of techniques and systems which, with minor adaptations, are still those of the last century. These inadequacies are brought to the forefront by practical applications of the science of information, now becoming widespread, such as the collective international catalogue (MARC machine readable cataloguing) organized by the Library of Congress.

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TITLE INFORMATION CONTENT ANALYSIS AS AN AID TO TEACHING THE USE OF COMPUTERS IN NATURAL LANGUAGE IR SYSTEMS

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Indexing terms from abstracting services are compared with the corresponding titles as a collective class exercise. The proportion of direct matches, synonyms and misses can then be calculated for the group and for various concept categories such as people, places, behavioural characteristics etc. Such title information content analysis is essentially the obverve function of a search of a natural language file. Its advantages are that a) it does not require computer time b) a subject area can be chosen which will minimize vocabulary problems for the students and c) it provides a good insight into natural language systems and their problems and can stimulate useful discussion of these. An example using Current Index of Journal in Education *is given.*

In general, students receive instruction in searching computer files (if at all) with whatever happens to be handy; CAS, MEDLARS or similar tapes may be used but there is, in general, no attempt to produce, *de novo*, tapes specifically suitable for library and information science students. Even the LEEP experiment using MARC. I tapes[1] made use of tapes prepared for an entirely different purpose and appeared to ask the question « what can we do with these tapes in library education » and not the more pertinent question « what experiences (with computer based systems) are essential in a librarian's education. The major plus point which I found in using the LEEP/MARC package was that students could often choose subject areas so that they were not faced with the vocabulary barrier problems which they would have had with CAS, MEDLARS, etc. tapes, since so few have the scientific background for using these effectively.

The experience reported in this paper was mainly obtained during seven consecutive offerings of a course on information systems in libraries at Syracuse University between 1968 and 1970. The exercise requires each student to select at random several subject index terms and to compare these with the titles of the documents to which they referred. The results for the group were then averaged and discussed in class.

The first group used *Chemical Abstracts* Subject Index but, not surprisingly, this showed up many cases where the vocabulary barrier prevented students from recognizing synonyms. For the next group *America: History and Life* Subject Index was used as it was considered that students would have much less difficulty in identifying synonymous terms. Nevertheless, when the individual results were summed prior to class discussion, each one was checked by a graduate assistant who had majored in history/political science. Most of the minor differences between the student's assessment and that of the graduate assistant were in the assignments submitted by overseas students.

Another group carried out the same experiment using *International Political Science Abstracts* Subject Index. (A colleague teaching Bibliography of the Social Sciences found that a presentation by some students from the Information Systems course on the information content of titles in political science was a useful part of a seminar on indexing services). Finally a small group of students at the University of Western Ontario used *Current Index to Journals in Education* (CIJE).

Of the several services studied, CIJE appeared to be the most suitable for title information content analysis. *a.* The vocabulary raises few problems with most students. *b.* Each entry gives the title (in English) plus citation; it then lists major and minor descriptors (taken from the *Thesaurus of ERIC Descriptors*) often followed by « identifiers » (which are additional identifying terms not in the *Thesaurus*) and occasionally an abstract. *c.* The descriptors are concise and do not require the student to split them up further as he may need to do with a long subject index entry in order to get discrete concepts for comparison with the title. *d.* Each entry has a consecutive accession number which facilitates obtaining a random sample with random numbers.

Each entry in CIJE has an average of three or four major and three or four minor descriptors. As they are not separated from the title, they can easily be compared with it. Furthermore the several major descriptors can be compared with the corresponding title (instead of comparing one indexing term with the corresponding title when a random subject index entry is taken). Since a large random sample is being examined when the class results are pooled, the average data obtained is the same.

The descriptors or indexing terms will either be reflected in the title or they will not. If they are, then they will occur either as words identical with (or a syntactical variant of) words in the title or they will be synonyms. Students were therefore instructed to categorize each descriptor (or component of a subject index term) in their sample as *a.* identical with, or a syntactical (inflectional) variant of, words in the title, *b.* synonyms or related terms for words in the title *c.* neither *a.* nor *b.* Categories *a.* and *b.* together represent those concepts which could in theory be retrieved from a titles index if all possible synonyms were used, while *c.* represents title-irretrievable concepts. Thus we have a dichotomous population for which the sampling error δ can be calculated from the expression $\delta = [C\,(100 - C)/N]$ ½ for a random sample of size N, where C is the percentage of title-irretrievable concepts[2]. Each student was given five different random numbers and instructions for selecting entries with them. They were also told to count the number of keywords in each title. The overall results for CIJE were 29 per cent *a*; 20 per cent *b*; 41 per cent *c*; $\delta = \pm 3$ per cent; 3.8 keywords per title.

In carrying out this exercise the students were forced to examine five document titles very carefully and to consider, on the average, about four synonymous terms. It is, of course, easier to answer the question, « is y a synonym of x? », than to generate all the possible synonyms of x as one does for a search of a natural language data base. Since the CIJE descriptors were thesaurus controlled, it is perhaps surprising that there were more class *a.* terms than class *b.*, nevertheless the proportion of synonyms was much higher than the 8 per cent, *b.* found in a similar analysis of *Psychological Abstracts.*[3] Services where the indexing terms are largely generated from the titles should be avoided for this exercise as they do not give students sufficient opportunity to consider synonyms and related terms. Students should be warned that they may encounter antonyms and to treat them as related terms, e. g. accident/safety.

This process of title information content analysis is essentially the obverve function of a search of a natural language file. The three categories correspond to *a.* hits, *b.* the increase in the number of hits when all possible synonyms and related terms are used and *c.* misses. In a computer search of a file it is normally very difficult to estimate number of misses or the recall ratio exactly. Here the recall ratio is (100 — % C) assuming all possible synonyms would be used. (The other usual criterion of search efficiency, the precision ratio, is not applicable since one goes from a particular document's indexing term directly to that document). The above are points to be brought out in class discussion. Up to the discussion the students only have a picture of the average recall ratio for the field as a whole, e. g. education. During the discussion period they are required to break down the indexed concepts into about eight different categories since one would expect, for example, the names of individuals to have different retrieval characteristics than, say, a curriculum subject. The concept categories finally decided on by the class for the CIJE analysis are shown in Table 1 (where the differences between concept categories are smaller than for some other subjects studied). People and places are obvious categories for most non-science subjects and there is always a « miscellaneous » category (which should be kept to a minimum).

By examining in detail the information content of titles, students gain a vaulable insight into the properties of a file based on titles and will appreciate the need for its enrichment by additional descriptors, etc. Furthermore data such as that in Table 1 are useful for demonstrating the reduction in recall when two parameters are "anded" together. For example if a behavioural concept is "anded" with a discipline, the recall would be (100 — 53) × (100 — 29)/100 = 33 per cent. Even though students may later use a computer based IR system in their course, this exercise appears to dispel some elementary misconceptions and to lower the "threshold of fear" of computer usage. It also simulates quickly (and cheaply) the recall data for a large number of computer searches of a natural language file, thus it appears to be a useful addition to courses in, for example, the developing countries where suitable computer facilities and/or data bases are not yet available.

Table 1

Title Information Content Analysis of CIJE

	Concept Category	*a.*	*b.*	*c.*	*%C*
1.	People (real and fictional)	8	2	7	41
2.	Institutions and Places	6	6	8	40
3.	Behavioural Characteristics	14	7	24	53
4.	Sociological and Historical Characteristics	24	5	19	40
5.	Physical Characteristics (inc. apparatus)	10	4	10	42
6.	Disciplines and subjects	21	21	17	29
7.	Miscellaneous	8	2	12	55
1-7.	All Categories	91	47	97	41

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Dr. R.T. Bottle taught physical chemistry for several years at Bradford. From 1968-1970 he was Visiting Professor at Syracuse University School of Library Science and wishes to thank students there and at the University of Western Ontorio for their cooperation in developing the technique reported here. He recently joined the Department of Librarianship, University of Strathclyde, Glasgow, Scotland.

BASIC ELEMENTS IN SYLLABUS DESIGN

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A brief discussion of the factors affecting the variety of courses now in existence, with an analysis of the elements which are common to all courses in varying degrees.

The common characteristic of syllabuses for the teaching of information science is their diversity. Undoubtedly this reflects the many interpretations and definitions of the phrase « information science ». I do not wish to comment on the reasons for this diversity; the fact is we have it and are likely to have it in the forseeable future. One can argue that a more uniform system of education would be more advantageous to the profession: that we should reach an international consensus on core subjects, whilst still allowing for local variations. On the other hand it could be argued that we reach a state of consensus through « natural selection ». The realistic courses prosper; they attract good students who find good employment prospects. Course designers bring elements of successful courses into their own courses and a consensus is achieved informally, although it is nonetheless real. I am not attempting to formulate definitions of information science or describe course content but to look at the general criteria which underlie education for information science.

One of the strengths of information science is our pattern of recruitment. We do not have a single method of entry, or a single kind of entrant. New members of our profession may be young, or mature. We have a variety of institutions providing courses, universities, polytechnics, professional associations. In a profession which is so much concerned with innovation and the transmission of ideas it is fitting that we should be able to absorb people of widely differing educational backgrounds and our courses should continue to allow for this. Effectively we are increasing the pool of talent and as long as we continue to do this our professional ideas will not stagnate.

There are at least two dimensions of growth in any area of activity. We can see a vertical development in the use of new ideas and techniques, from other subjects, in our own field. We should not neglect however the horizontal dimension of development. By this I mean the reciprocal contributions which our field can make to other subjects; not so much in terms of the actual information contributed but in the methods and values of information science. We can do this in our courses by encouraging our students to be outward looking towards other activities and to regard their work as « open-ended ». In an educational institution such as a university or polytechnic, teachers of information science can bring appropriate parts of their subjects to students of other faculties. This should be more than a public relations exercise but a demonstration of the value of information science to the student in a living situation. My own Department at Leeds Polytechnic is engaged with the Departments of Chemistry, Architecture, Life Sciences, and Three-dimensional Design. In these activities we see our subiect as helping these students to organize their own work now and in the future when they come to exploit or initiate information services.

In designing a course of any kind I think we must consider the behaviour we are trying to produce in the student. We must look upon the course as more than a transfer of knowledge between teacher and taught. On completion of a course the student must see the work in a light different from that which he had at its commencement. I would suggest therefore that we should try to identify those qualities which are possessed by the « well-educated » information scientist and consider if it is possible to develop these qualities in students through particular courses.

I am putting forward the following characteristics not as a definitive list but as a basis for discussion and refinement.

1. *Motivation*: If a person is to work well he must have strong motives. Ideally the strongest motives would stem from user problems and needs. The deepest level of motivation is identification with the user in that the information scientist considers the user's needs and problems as he would his own. The information scientist should be aware of the sense of urgency, frustration, bewilderment when the service does not provide what the user needs. Substitutes for this level of motivation are « doing a good job », « loyalty to the service — or profession », even personal ambition. These do have a place in total motivation; they may provide an added sharpness and precision but if we act principally from these motives then our action will lack a consistent basis.

2. *Insight*: Essentially the information scientist is an interpreter of the information system. Inevitably the system cannot serve all the users perfectly all the time. The information worker is required to present or represent information to satisfy an individual need. Subject knowledge may be involved but even more fundamental is the insight into the real needs of the user.

3. *Knowledge*: Our knowledge is of two kinds *a.* knowledge of the subjects with which we are working. *b.* professional knowledge of information science.

a. I am assuming that the more subject knowledge an information scientist has, the more likely he will produce an efficient service. Our basic problem is that we receive such varied subject demands even when working in the most specialized circumstances. It seems that the fundamental faculty a student needs to develop is not primarily a knowledge of subjects but the ability to assimilate facts and ideas quickly. In stating this I am not demoting the idea of specialized knowledge; it is a fundamental part of the information scientist's background but the nature of our work demands that we grasp quickly the essentials of the unfamiliar.

b. There are professional principles which can be regarded as important to the information such as retrieval, abstracting, dissemination. Without considering actual content we can however state that it is possible to structure the teaching of professional knowledge to convey to the student subject knowledge in a systematic manner.

4. *Judgement*: This faculty follows from the proceeding factors. Essentially it is the selection, from all that the student knows, of the data relevant to a particular problem. For example in dealing with a particular search problem the information worker will assess the needs of the user, likely sources, a suitable strategy and method of procedure and produce a solution appropriate to the user needs. It implies experience in a working context but the student can be guided towards the process of decision making.

5. *Action*: The preceding abilities are useless unless they result in action. In our context action is perhaps of two kinds. *a.* self action. *b.* promoting action in others, equals, subordinates, superiors.

a. Self action. Again this may be divided into two kinds *i.* immediate day-to-day action as expressed by the demands made upon the service. *ii.* development work based upon future needs or improvements to the service. A large part of this action depends upon the initiative of the information scientist, in his ability to be sensitive to operations and willingness to do extra work.

b. Promoting Action. This type of action varies according to the level of operations. In dealing with subordinates it may take the form of instructions presented in such a way that the work will be carried out efficiently and happily. In dealing with equals and superiors it may take the form of a well presented oral or written report.

Action implies developing the qualities of a good manager which are themselves based on identification, insight, knowledge etc.

I am not suggesting that every course should give equal emphasis to all these qualities. A short course for senior staff would not perhaps need to dwell greatly on « motivation » but a three year undergraduate course would need to emphasize motivation in the beginning and slowly develop the others throughout the course. The important point which we should not forget is that knowledge by itself does not produce effective information scientists and we should give earnest thought to the kind of person our student is at the termination of his course.

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ITALIAN LIBRARIES ASSOCIATION'S CONTRIBUTION FOR THE PROFESSIONAL TRAINING OF LIBRARIANS

by
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The author illustrates the steps taken by the Italian Libraries Association (AIB) towards the training of librarians in Italy. During its last meeting, Perugia, May 1971, the association recommended: the teaching of research methodology in secondary schools, the institution of suitable technical institutes for training library assistants, and an item which has been considered imperative, the creation of degree courses for librarians in Italian universities. The promotion of the « National List of Trained Librarians » was also initiated during the last association meeting.

A short account of the present unsatisfactory situation in Italy is given as well as illustrations of various action to improve conditions.

The evolution of the dimensions and methods of retrieval, a macroscopic phenomenon of our time, could not be ignored in the libraries sector because, as libraries are the basic instrument for any cultural and scientific investigation, they are the first to be affected by the increased demand for services. Unfortunately the unsatisfactory organization of the various institutes as well as the small number and low professional standard of the personnel have caused latent problems to worsen, created new ones and made the professional training of personnel working in libraries a question that cannot be postponed, since it is this that conditions the success of any structural reform.

With a most useful action of propulsion, having studied the consequences of the development of research on library organization, and assessed the prospect offered by modern documentation methodologies, the Italian Libraries Association is suggesting the solution of the problem raised by the new situation in the training of both librarians and users, to be « conditioned » from the time they are at school.

In this direction the work of the AIB Congress, held in Perugia in May this year, gave a further boost to the programme for the creation of a system of training for the profession of librarian. The document of the Working Group on professional training suggests three aims: teaching of retrieval methodology from the secondary school level, creation of suitable professional technical institutes for library assistants, creation of special degree courses for librarians. This would lead to a network of methodological information on bibliographic retrieval which, starting from the furthest and most favourable point of departure — the secondary school — would guarantee the serious preparation of future librarians and future library users. In fact, present retrieval systems and even more those of the very near future, call for a methodological preparation of the user as well, so that he can carry out fully his research on a given subject.

Among these three levels of training the Perugia document indicated the institution of professional degree courses, in line with other similar cultural courses, as the prime task to be undertaken immediately. The institution of such courses should be included in the new university pattern, still being discussed by Parliament. The degree course — lasting four years; divided into two two-year periods — has been devised in two main streams, for archivists and for librarians. Regarding librarians, at the beginning of the second two-year period, the student must choose between the librarian-documentalist course and the curator course. After the degree course, an apprenticeship lasting six months in suitable libraries, as indicated by the Higher Council of Academies and Libraries, will give the training a concrete footing. During this apprenticeship, the student will receive a study grant and will work on a full-time basis, practising in every sector of the library.

The dilemma as to whether training of librarians should be provided by the libraries or by the universities has been decided therefore in favour of the latter. It was considered that a large part of the teaching, of a cultural and interdisciplinary nature, calls for regular classroom lessons which can more easily be provided by a university. It was also considered that the favourable prospects offered by a kind of job undergoing great development would attract young, well-trained people to our profession.

The Perugia document was drawn up on the basis of the opinions expressed by the members and of the proposals and suggestions advanced by the Special School for Archivists and Librarians of Rome University.

The possibilities of development for the profession bound up with the institution of degree courses are also supported by a second programme of the Italian Libraries Association at the recent Perugia Congress, namely the proposal of the « National List of Trained Librarians », which had for long been an aim. This List, divided into two sections, one for librarians and the other for library assistants, will be kept updated by the General Direction of Academies and Libraries of the Ministry of Education. The text of the project, which has been submitted to IFLA (Internation Federation of Library Associations), has already started the procedure for approval by the competent organs.

Thus something positive seems to be taking shape to qualify even outwardly this profession, the training and diffusion of which conditions the cultural and scientific development of every country, but in particular of Italy, where the preparation of adequate structures for the best possible cultural and scientific training of citizens has been placed among the most immediate and most important of policy aims. The library is the main instrument in the research sector and it is therefore necessary that a wise policy will grant with timely measures the attention and the means necessary for development.

Such are the initiatives for the future.

Let us now take a rapid glance at the present situation of professional training in Italy. Or rather, we should say, at the present lack of any planned professional training. The schools of advanced study in certain Arts Faculties are doing their best to make up for the organizational defects. The main one is the Special School for Archivists and Librarians in Rome University, set up in 1956 by the farsighted Professor Bartoloni. The School grants a post-graduate specialization diploma in professional subjects. Moreover it has arranged for years together with the General Direction with the General Direction for Academies and Libraries, courses of technical qualification and refresher courses for the managerial staff of the State public libraries.

For those in charge of the popular and school libraries there are special courses, run since 1935 by the Libraries Superintendencies. As an intermediate solution, until the constitution of professional technical institutes, these courses should also be designed for library assistants, who at present start on their career untrained from a professional point of view.

There is no lack of other initiatives, which have borne useful fruit, by such well-deserving institutes as INIP (National Institute for Increased Productivity), the CSAO Group (Centre of Studies and Applications of Company Production and Transport Organization), in Turin Polytechnic, and so on. To remain in the AIB field, let us recall the Study Group for the Training of Special Librarians and Documentalists, set up in 1966, whose foremost aim was the training of specialized teachers to lead the courses of professional training. A course with foreign lecturers had been programmed, but it was not possible to hold it because of the usual lack of funds. We will also mention the Course on automation held in two periods, in March and April of this year, at the National Centre of the Union Catalogue of Italian Libraries, by the AIB Group for the Rationalization, Mechanization and Automation of libraries, with the assistance of IBM. The texts of the lessons of this course, which was the first one of its kind in Italy and which proved extremely interesting for the prospects opened to participants and the methodological guidelines provided, will shortly be available.

The above-mentioned AIB Group for the Rationalization, Mechanization and Automation of Libraries also foresees a series of other iniziatiatives and in particular, at the closing of the Perugia Congress, it looked forward to:

a) the organization of periodic introductory courses on automation;

b) the organization of a series of Study days on particular subjects;

c) the promotion of seminars in different place (e.g. the university);

d) the promotion of « guideline days » at regional level.

It is also to be expected that the work of the Papaldo bis Commission, by the Ministry of Education, whose task is the study and proposal of the structures necessary for the general reorganization and concentration of cultural assets, will make a contribution to the solution of the problem. Through its representative, the Italian Libraries Association has made concrete suggestions to the work of this Commission.

We will close this brief glance on the present situation of the professional training of librarians in Italy, with the wish that the proposals of the Italian Libraries Association may contribute a concrete solution of the problem.

Dr. Maria Califano Tentori was born in Rome on 28.11.1922. In 1945 she took an Arts Degree at Rome university and subsequently diplomas for palaeographer archivist (Archivio Segreto Vaticano) and in Library science and bibliography (Vatican Library). After posts at Rome University and the British Council (Rome), in 1951 she joined the Library of the National Research Council, where since 1969 she has been responsible for the periodicals Department. In 1971 she was appointed the Assistant Librarian (Vice-Director). Since 1970 she has been a member of the Special Libraries Commission of the Italian Libraries Association. In 1967 she published a bibliography of the catologues of periodicals belong to Italian libraries: « *Elenchi e cataloghi di periodici in Italia*: 1946-1966 » (Note di bibliografia e documentazione n. 10, CNR 1967), the first bibliography of its kind to be published in Italy. Currently she is concerned with the problems of the organization of library services and the introduction of the new techniques of mechanization and automation in libraries.

INFORMATICS IN THE TRAINING OF DOCUMENTALISTS

by
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The limits to the teaching of informatics at the different levels of training for documentalists are examined in the light of the plan of an introductory course in documentary information, tried out in France on students and also on practising documentalists. In conclusion two types of new, complementary bodies are defined, which would guarantee developing countries full success in their efforts to train documentalists and would facilitate the setting up of an efficient documentary infrastructure: documentary « workshops » and mobile service teams.

The following few remarks are the outcome of a dual experience:

- of development and use of automated documentary systems since 1961
- of participation in recycling or teaching programmes for documentary information (at initiation level), since 1963, and of permanent contact with documentalists engaged in similar ventures, or on the point of engaging therein.

At a teaching level, this experience has led to the course plan entitled « Introduction to documentary informatics » which is reproduced in the annex.

This plan is the result of subsequent manipulations and developments of an initial version used for the first time in 1968, for a two-day advanced course organized by the French Association of Specialized Documentalists and Librarians (ADBS). Developed in 1969 for a four-day advanced course (the penultimate of which was fully devoted to the presentation of four productions by their authors), organized by the National Technical Research Association (ANRT), it was again used in 1970 by the National Institute of Documentation Techniques (INTD) as a buffer between a course in general informatics given by an information expert and some illustrative lectures given by those in charge of automated documentary units. In this framework, it was allocated six course hours and one hour of practical work and discussion (which is clearly insufficient).

Lastly, in 1970 and 1971 it was applied in the final form reproduced here:

- in four study cycles of ADBS (ten-day courses, followed by a visit to an electronic centre);

— for the documentation option of the University Technology Institute « Information Careers », Bordeaux, with forty-five hours of courses and practical working session — discussions (some students presented reports on cases taken from specialized literature).

Developed to a greater or lesser extent according to the time allowed and the participants (students or serving documentalists), it has thus been tested out for three years on some 350 persons, of whom 110 were students.

In the light of this experience, we think it falls in well with the following objectives:

— further training of serving documentalists:

 — deemystifying in their eyes the computer and informatics

 — giving them notions and elementary definitions necessary to understand specialized automatic documentation literature, and to converse with information experts (at the level of defining needs, aims and products of documentation, not operating techniques)

 — warning them of the difficulties and constraints of automation, also putting them on their guard against certain debatable or even unacceptable (often ill founded) requirements of informatics experts

— training of students:

 — showing them all the resources but also the difficulties and shortcomings of present information techniques.

In the advanced training of serving documentalists, Chapter 2 of our plan: « theoretical bases », appeared indispensable, including a reminder of notions known in principle (paragraph 2.3 on documentary languages, especially, always causes some surprise when we claim that one can automate efficiently whatever the type of documentary language used, the false idea that a thesaurus is an essential first step being so firmly held).

This paragraph, and even the whole chapter, could be eliminated from teaching to students, since the corresponding notions will generally have been acquired previously.

Likewise, if the students have already had a general course of informatics, Chapter 3 and certain paragraphs of Chapter 4 could be shortened or eliminated. However, experience has shown us a certain tendency of information experts in charge of general informatics courses to lay too much stress on theoretical or technological notions that are useless to documentalists, to the detriment of input-output problems, organization and data processing, the most important questions in all documentary application and of direct interest to documentalists.

In our view it is useless to embarrass future documentalists, most of them with a literary background — at present, at least — with questions of binary, octal and hexadecimal notation, or with algorithms for the solution of mathematical problems, however simple they might be. On the contrary, it is indispensable to tell them about paper tape and its possible applications in documentation (in the two cases where the students had had preliminary instruction in general informatics, this technique had not even been pointed out to them!).

This is why we lay such stress on the supports and the recording of information. The length — sometimes considered execessive — of our Paragraphs 3.1 and 3.2 devoted to punched cards and punched tape, is however justified also by a didactic consideration: starting from these techniques which are easier to implement, the explanation of recording and processing on a magnetic support is then rapidly assimilated.

We would state, lastly, that in actual fact each paragraph of Chapters 5 and 6, very little developed in the plan, is discussed in detail and illustrated by numerous examples: documents, samples or case descriptions.

* * *

We have intentionally entitled this teaching « *Introduction to documentary informatics* », in order to underline the limits of our ambition. At this level, there should in our view be no attempt to give all documentalists a real « *Initiation* into documentary information », enabling them to participate actively in the study and implementation of an automatic system. Our introduction gives only the indispensable preliminary bases for a possible initiation to this higher level. But, for the majority of documentalists, the general points and the examples contained in our introduction suffice, and will suffice, even with the development and perhaps the future generalization of automated documentary systems, access to which will be given them, but in the conception of which very few will participate. Only those who take an active part in it will need to acquire a complementary training, at all events indispensable to update in the ceaselessly evolving knowledge on the subject. But they will be very limited in number, and in no case will they replace the specialized information personnel, the analysts and the programmers.

This does not prevent any documentalist who might wish, from necessity, taste or intellectual curiosity, from becoming more deeply initiated into documentary information, analysis and programming, or even from becoming specialized, following courses in schools or institutes of programming, some of which have already included documentary applications in their programmes (e.g. in France the Institute of

Programmation of the University of Paris-VI, and the Institut de recherche d'informatique et d'automatique).

But it does not appear either possible or desirable to generalize apprenticeship of informatics in documentary studies in the same way as one envisages, for instance, such apprenticeship in scientific or technical studies or even commercial studies. This would mean giving a false and dangerous appearance of simplicity to documentary problems. Mastering information resources in order to solve them effectively is, in fact, far more difficult to attain than that required, for example, of the physicist who wishes to effect even very complex calculations. This is due mainly to the opposing natures of the two types of applications: the problem of the physicist can involve complex algorithms and logic, but only occasionally (perhaps just once), out of a generally very limited volume of data to be processed. The standard documentary problem, with a frequently very rudimentary logic, will on the contrary regularly call for the processing of very large quantities of data, which must thus be very rapid and economic.

If such were needed, the results of an inquiry run by the American Association for Computing Machinery, which reveals, for the same problem posed to a dozen experienced analysts-programmers

— in writing the programs: a gap of 1 to 11 between the quickest programmer and the slowest;
— in finalizing them: a gap of 1 to 28;
— in program length: a gap of 1 to 6;
— in machine time of implementation: a gap of 1 to 13;

amply demonstrate that programming is not an amateur business!

And that while one might admit amateurishness in scientific problems whose solution requires only seconds of machine time, the same cannot be said of documentary applications which currently require some tens of minutes, even hours!

Hence it seems that the study of analysis and programming should normally be reserved to those documentalists who specialized in documentary information, ultimately to become analysts-programmers or advisers in this field.

But it can nevertheless be useful, in a higher-level training, to give documentalists some notions of analysis and programming, not to teach them to carry out these tasks, but to facilitate their contacts with informatics experts. In France, some documentalist training schools or institutes introduced these notions into their curricula one or two years ago. (Need it be emphasized that to be fully efficient this teaching should be supported by real practical work on a computer?).

At the stage of advanced instruction for serving documentalists, a first attempt was made this year by ADBS, in a two-day advanced course entitled « Introduction to programming languages », in which the main types of language were presented and illustrated by examples of documentary application.

We would also point out the course for librarians-analysts also organized this year for the first time. This was an intensive four-week course, half given over to analysis and half to programming. This was a complementary training at a higher level of the type referred to before, here intended to prepare librarians to participate actively in the automation of their services.

This brings us to underscore the importance of a problem that is not specifically connected with information, but which has become evident through the requirements of information. This is the problem of functional analysis, in principle independent of any machine or technique, but an essential preamble to putting them into operation. The documentalist must be able to analyse in detail all the elementary operations which go towards the performance of the various duties falling to him. It has been said - and not merely as a wisecrack - that in order to automate a process or a service, it is necessary, in this order:

1. to command a machine (here a computer)
2. to perform a functional analysis
3. to annul the command,

for the reorganization suggested by the analysis might lead to the conclusion that it is useless to automate in order to improve the service!

If this analysis, dictated by the imperatives of informatics, has often been conducted by (at best, with) informatics experts, in their view it could in future be conducted by the documentalist alone. It is therefore undoubtedly best to include these new techniques (collectively called *« systems analysis »*) on a priority basis in all higher-level documentalist training courses, before any initiation into documentary informatics, and independently.

The need to teach these techniques to documentalists will continue and will become even more imperative, whereas that of inculcating in them the rudiments of informatics as now conceived will gradually disappear, as it becomes a part and parcel of daily life. The development of hardware and software will become the business of specialists alone and the user will have no need to know the principles and details any more than he now knows those of the telephone, the radio, television, the car, or — to stay in the documentary field — modern photocopying machines, electrostatic machines, etc..

* * *

But meanwhile, at present and in the immediate future, this is how we conceive the teaching of informatics for documentalists.

1. An introductory course analogous to the one we have tried out, the plan of which forms the annex hereto, should serve both to *train*

intermediate-level documentalists and for the *advanced training of serving documentalists,* subject to adaptations or variations to fit the two cases (taking account, for instance, for students, the subjects which they are taught elsewhere).

It does not seem indispensable to us (especially in developing countries where the few specialists run the risk of being overburdened) to precede this course by elements of general informatics. It is, however, necessary to provide for a visit to at least one well-equipped and well-organized information service, even without any documentary application in service.

To both sections, as many documents and samples of automated document productions as possible must be shown, and several well-chosen concrete cases must be outlined to cover the gamut of applications.

In the advanced course, a minimum of three days (eighteen hours) plus one visit should be earmarked.

In the training course, there should be a minimum of thirty-forty hours, including practical work, discussions, outlining of actual cases and visits.

2. At the *lower level* of *assistant documentalists,* it seems enough to inform the students of the possibilities of informatics. The same scheme could be followed, without going so deep (just general points about instruments and methods, but presenting the ensemble of basic applications). Such a course could be run in twelve hours.

3. A *higher training* course would follow the same plan as the intermediate course, but going deeper into some of the subjects dealt with, especially paragraph 4.3, which could be considerably developed, giving the rudiments of analysis and programming (in a high-level language, Cobol, for example), using instances of documentary applications.

(It is clear that, if students in these courses have been through the intermediate level defined above, Chapters 3 and 4 would be treated merely as a brief refresher, whereas Chapters 5 and 6 could be developed somewhat more).

This course would probably also require at least thirty-forty hours. It would be desirable for the practical programming work to be done on a computer.

N.B.: higher level teaching could not, in our view, be seriously envisaged if the students do not have a good library available containing foreign (particularly American) works and journals of documentary techniques necessitating a fairly high annual purchasing and subscription budget.

4. Is it necessary to train *specialists in documentary information?*

Such specialists are indispensable, but needs are well covered, in each developing country, by a very small team belonging, for example, to the national documentation centre or institute. Assigned the task of automation in the framework of the national network (and international link-ups), this team would also act as an advisory body outside of the official network, supplying technical assistance to the firms or services wishing to automate their documentation.

It does not appear necessary — and it would undoubtedly be very difficult — to create locally any teaching of documentary informatics to train this initial nucleus of specialists. Selected preferably among students having a higher level diploma in documentation, they would first follow a course in analysis-programming in the country, or — failing this — abroad; then, necessarily abroad, a specialization course in documentary informatics, in a specialized training institute or in a large automated documentation centre.

It is obviously these who would subsequently be called upon to teach informatics to the three levels of training for documentalists. This initial nucleus, the motive force in developing the automation of documentation, could eventually take on the training of specialists of its own level, to guarantee development and continuance.

In fact, the scheme briefly mapped out here for specialists in documentary informatics should be applied to the ensemble of documentary techniques and resources, in developing countries.

* * *

To conclude, we wish to stress two elements which in our view are essential to guarantee the full success of efforts to train documentalists in developing countries, and the establishment of an effective documentation superstructure:

1. Teaching of documentary techniques cannot be fully effective unless supported by real exercise in the techniques taught, in what we will call « *documentary workshops* », where the students would be guided to solve all the problems in current practice, with the appropriate material, on a real collection, instead of having just fragmentary practical works, not linked with one another, and more or less fictitious. This implies their active participation in the life of a documentation unit associated with the school, and permanent high-level links.

2. Upon their entering professional life, the students often find themselves up against insuperable practical problems for want of material and personnel, re-establishing the formerly anarchical situation:

collections to be inventoried, filed, catalogued, indexes or catalogues to be established or reorganized, etc. They must be helped to turn this difficult corner rapidily, so that they may devote themselves as soon as possible to the current work, instead of losing months doing depressing tasks ... or giving up, with an unpleasant memory of the profession. Such help could be given by a technical assistance team which would make available to them, for the time necessary to get things started, its entire potential (know-how, material, manpower). Such *mobile service teams*, each led by a very competent documentalist, would come under the national documentation centre or institute, which would place them temporarily with the organizations requesting them. (In like manner, the documentary information team would participate in automation operations, not only at the outset of the project as advisor, but also in getting it off the ground, to initiate the collection of data or to re-absorb any overly large arrears. A number of documentary units wishing to automate one of their activities or another in fact stumble against this material problem which is sometimes enough to turn them aside from their project).

It is unnecessary to stress the range of experience offered to young documentalists by entering such well organized teams, but it is essential to insist on the fact that they will have to agree to perform even material tasks considered highly unrewarding!

It may not perhaps be forbidden, however, to combine the two types of organs defined above, somehow or other: documentary workshops and mobile service teams. We do not hide from ourselves the difficulties of such an undertaking, but assuredly the experiment is worth trying.

ANNEX

Introduction to documentary informatics

Curriculum of Study Course A-I (ADBS), 1970-1971

1. *Definition of documentary informatics*

The application of automatic (electronic) data processing techniques to documentary problems.

The main documentary functions that can be automated are:

- management of collections and services
- distribution of information:
  - collective distribution by bibliographical bulletins
  - selective individual distribution
- selection: retrospective search for reference or data (automatic bibliography, questions/answers service).

2. *Theoretical bases*

Reminder of basic definitions and notions

2.1 *The documentary store* (memory), its symbolic representation: the documentary matrix.
How, following the manner in which it is analysed, it makes it possible to classify the different methods of selection, according to the nature of the « selective elements », elementary cells of the documentary store.

2.2 The essential *logic elements:* reminder of definitions and useful logical relations in selection operations:

- — identification
- — batching
- — intersection (meet)
- — negation and exclusion
- — inclusion
- — separation

Illustration of the corresponding operations on the documentary matrix.

2.3 *Different sorts of documentary languages:*

- — hierarchical structure (definition of essential notions for inclusion)
- — combining structure (definition of essential notions for intersection)
- — mixed structures.

The « spectrum » of the different indexing systems, ranging from multidimensional (combining) systems to linear (hierarchical) classifications, through all the intermediate stages.

2.4 *Codes and coding*

Definition of the three levels of coding:

- — idealogical code (intellectual)
- — functional code (symbolic translation of the foregoing)
- — recording code (material) (transliteration of the foregoing on the support used)

Natural alphabetic codes:

Uniterms (M. Taube), Descriptors (C.N. Mooers), Thesaurus.
Problems of expression of relations.
Systematic codes (e.g. Universal decimal classification)
Mixed codes and complex artificial languages (e.g. Syntol).

3. *The instruments*

Automatic data processing machines and supports.

3.0 The three basic supports.

3.1 *Punched cards and multicopying machines*

3.10 Punched cards

3.11 The range of classical machines:
- card making:
  - card punch
  - verifier
  - reproducer
  - translator

- ordering and processing of card files:
  - sorter
  - collator

- data utilization:
  - tabulator

3.12 Data notation:
- linear representation
- two-dimensional (or binary) representation
- overlay

3.13 Organization of card files:
- a single card per document
- a set of cards per document
- a single card per characteristic
- a set of cards per characteristic
- one card for each characteristic in each document.

3.14 *Special* machines and techniques:
- carrier
- document selectors
- special cards (window cards, self-reproducing cards)
- punched card cameras

3.15 Fields and conditions of efficient application.

3.2 *Punched tape and automatic typewriters*

3.20 Punched tape

3.21 Punched tape typewriters and auxiliaries:
- simple machines for repetitive typing
- taped program machines

- machines connected to a computer (terminals)
- punched tape selectors and sorters.

3.22 Tape-to-card transcribing

3.23 Fields and conditions of efficient application:

- recording of initial data (possibly as byproduct of a normal typing activity)
- integration of certain stages of documentary data processing.

3.3 *Magnetic tape and electronic computers*

3.30 The magnetic tape

3.31 Direct recording of data on magnetic tape (and piloted multi-recording)

3.32 The electronic computer and its components:

- the central unit and control circuits
- data input and output units:
  - input:
    - punched cards
    - punched tape
    - magnetic tape
    - automatic reader
    - direct input with connected keyboard
  - output:
    - punched cards
    - punched tape
    - magnetic tape
    - printers
    - microfilm
    - visual display unit
  - memories:
    - internal store (main memory)
    - backing stores (auxiliary stores):
      - sequential access: magnetic tape
      - direct access (or random): magnetic drums, disks, fiches, cards
      - mixed type.

3.33 Special magnetic selectors (digital or analogue).

4. *Methods*

Storage and utilization of documentary data.

4.1 *Data input*

4.11 Nature and form of initial entry:
- pre-edited entries
- free label entries
- transposition on magnetic tape: notions of word, entry, block

4.12 Special requirements for automatic processing:
- extreme precision and absolute respect of rules of data presentation
- possibilities of automatic control

4.13 Comparative efficiency:
- punched lists or raw documents?
- punched cards or punched tape?
- pre-edited or free entries?
- precoding or automatic coding?

4.2 *The organization of data in storage*

4.21 Sequential access storage:
- direct card file
- inverted file
- mixed file

(special case of binary notation, as opposed to the usual digital representation)

4.22 Addressable memories (and special case of « associative » memories)

4.23 Comparison among the various solutions
In the case of retrospective searching, one cannot generally decide *a priori* the best method (the most efficient and the most economic).

4.3 *Organization of processing*

4.30 Definition: intellectual equipment

4.31 Stages in automation:
- problem analysis:
  - functional flowchart
  - machine flowchart

        - — program flowchart
        - — programming
        - — finalizing
        - — utilization

4.32 Program languages:

- — machine language
- — symbolic languages (source language):
    - — machine-oriented
    - — problem-oriented (high level):
        - — scientific: Fortran, Algol
        - — administrative: Cobol
        - — mixed: PL/1
- — translation programs (according to nature: assembler, compiler, interpreter, generator)
- — systems of utilization

4.33 Importance and difficulty of programming; special case of documentary applications
Is it necessary to program its application or to use an existing program in the program library?
(Interest and slavery of « packages » and commercial systems).

4.4 *Output of results*

4.41 The multiplicity of possible outputs from a single input

4.42 The defects and shortcomings of the usual printers

4.43 Contribution of reproduction techniques to informatics.

5. *Applications*

Present solutions

5.1 *Management of collections and ancillary tasks:*

- — acquisitions
- — catalogues and inventories
- — management of periodicals
- — management of loans
- — management of intellectual equipment (classifications, lexicons, thesauri).

5.2 *Distribution of information:*

- — collective distribution by library bulletin:

- traditional formulae
- new formulae: combining or reco-ordinated indexes (permuted indexes: KWIC, KWOC, etc.); index of citations.
- selective individual distribution.

5.3 *Documentary search* (retrospective search, automatic bibliography, questions/answers service)
The dilemma of being exhaustive or precise (silence and noise)
Servitudes, gaps and defects of the present solutions.
Necessity and interest of full integration of the various tasks that can be automated.

6. *Prospects*

6.1 *Problems being solved:*

- retrieval and distribution of bibliographical data on magnetic tape
- direct interrogation in conversational manner
- automatic composition of library bulletins

6.2 *Problems under study:*

- Automatic reading, indexing and translation
- Remote direct-access data banks, and documentary interconnexion and telemetering networks.

7. *Decision criteria*

How to design, prepare and tackle the automation of a documentation unit.

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THE TRAINING OF SPECIALISTS IN THE FIELD OF ECONOMIC DOCUMENTATION: AN ACCOUNT OF EXPERIENCE IN PORTUGAL

by
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The need for training information workers in economics, organizing those working in documentation services, establishing guidelines for standards and division of labour, and incorporating knowledge of information science into the specializations of documentalists were some of the problems concerning information, which came to light, during the expansion of the economy in Portugal. The origin and structures of the Economic Documentation Section of INII is discussed, as well as the creation, under government order, of a Working Group for Economic and Social Information.

In the past few years in all countries there has been a continuously increasing explosion of scientific and technical publications. The expanding need for information has been particularly felt in the developing countries which, because of their situation, have had to encourage technicians and scientists to work in the fields of production, research, teaching and administration. As a result of their expansion these countries have come to realize that they are in need of adequate organizations to handle documentation and make relevant information available to research workers and other enquirers.

In view of this it became evident that those who refer to documents, as well as the specialists who handle them, needed training.

Possibly the need for research assistance was felt by everyone at the same time, so that it became necessary to find competent and qualified assistants. However, as happens in any form of development, not all the work was started at the same time nor, in fact, was it always started at the beginning. This is why information services were often organized at first on an amateur basis, that is to say by people who loved their work, were curious about it, had ideas, intelligence and intuition who started from scratch, without experience, but the work had to be professionally organized.

Specialists in documentation found that they needed a reserve of knowledge which they did not have and which with the incorporation of auxiliary techniques, would constitute a Science. Though the Science of Documentation and Information is recent, it is considerably varied, since it touches many other sciences and is applicable to any subject.

Gradually specialists in documentation came to understand that their profession had to be clearly defined so that they could be objective, effective and relevant. To achieve this it would be necessary:

— that those standards accepted and followed by the majority of specialists be respected;

— that a rational division of labour be worked out, leading to more productive work. Since in the case of documentation the product is information, the system should lead to complete diffusion of information.

It became essential to penetrate the secrets of this new science. For specialists it was not a question of knowing general principles, rather of working out what details would be applicable in each single case. As with other sciences, information science progresses along its own lines, but it keeps in touch with developments in other sciences. Documentation specialists need to incorporate their knowledge of information science in the specific sphere of their specializations; also they must keep in touch with progress made in sciences connected with the field in which they work.

Those who have need of documentation and information must find out how to make the most of services available. They should have a general knowledge of this science and its objectives and possibilities. Knowledge of details can, however, be acquired as needed. The best way of making the most of the Centres of Documentation is for the reader to persevere in using them. He will then learn how to obtain the specific information he is looking for.

It would be out of place here to discuss the theory of the information science or its techniques, but I shall now give an account of what has been done in Portugal.

For some time now there has been an expansion of the Portuguese economy, particularly in the industrial sector. Research parallel to this expansion underlined the need for information based on well-organized documentation.

The National Institute of Industrial Research, which comes under the Ministry of the Economy, offers, among other activities, an Economic Studies Service connected with industrial promotion and development, which has made important contributions to the expansion of the Portuguese economy. Shortly after it was set-up it was evident that it needed to be re-enforced by an adequate information service. For this reason, in spite of the existence of a general information service, a specialized centre for economic documentation was set-up. This was approved in July 1967 and work was started immediately.

The general lines that were followed in setting-up the information service were determined after objectives had been worked out, and the needs of technicians, research workers and others established.

Since a system such as this one could only be provisional, in 1968 it was decided that in order to put the service on a professional basis a member of the staff, who would eventually take charge, should be trained in foreign Centres of Documentation.

The Economic Documentation Section provides information to research workers from other sections of the Service each week and, on request, it will provide information from its available reference works to any enquirer. It publishes a bulletin on economic documentation, giving information from specialized services, catalogues of economic studies, notices and reports from conferences, and bibliographical publications. It also published specialized bibliographies. The first on « Industrialization » has already come out, and a second one, on « Urban Development » is in the course of preparation.

In the meantime the need for documentation and information came to be felt in other public departments and in private enterprises. An almost spontaneous agreement for co-operation and division of labour was made between the Economic Documentation Section and the Plan's Central Library and, shortly after, with the documentary service of an important private industrial enterprise, the National Petrol Refinery.

Those in charge of documentation in the three centres agreed to work together on the preparation of a catalogue, recently published, of periodicals dealing with economic and social problems which is to be made available to public departments and private industries. A pool of information has now been established, which brings together thirty institutions with an interest in such problems.

While this work was going on a permanent study group for economic and social documentation and information was set-up as part of the President's office, with the aim of following up work already started, co-ordinating and developing exchange of information between the groups that form part of the pool, and establishing regular contacts with other national and international organizations with similar interests.

Since the groups that form part of the pool have different economic and social interests: industry, tourism, transport, urbanization, banking, teaching, social work, health, information, and so forth, it is our hope that with rational planning we can build up a reserve of knowledge that will give valid assistance to those organizations in Portugal seeking economic and social information.

In order that these aims be achieved, the different organizations involved must have professionally trained specialists in documentation. At the same time it is our hope that the high standards with which this work is carried out will give confidence to those who make use of the service.

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WHAT ARE THE DESIRABLE PERSONAL CHARACTERISTICS OF AN INFORMATION SCIENTIST?

by
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The effectiveness of many tasks in information work depends upon the direct intercommunication of the information scientist with the user. The desirable personal characteristics of the information worker, to be looked for in students in particular, are therefore considered in detail. These are: a relatively wide range of knowledge and interests, persistence in effort, and an outgoing personality, together with the ability to present information accurately and logically.

Information science, as practised in England, comprises the collection, collation, evaluation, and organized storage, retrieval and dissemination of information in various forms, and to various types of users. The definition covers a wide range of techniques, from handling the literature to devising a computer system. The information may cover a great variety of topics in many languages. The work may demand skills in writing, abstracting and classifying, or special knowledge such as that of patent law, or computer systems design and programming.

It is desirable that those in the profession should be versatile enough to undertake at least a good number of such tasks, though obviously there will also be specialists. In considering education for information work there arises the need to select students who will be likely to do well and one is thus frequently reminded of the need to consider the bases on which a choice must be made. At the City University, London, we are now fortunate in receiving a very large number of applications for our Master of Science and Diploma courses in information science, so that a careful choice can be made. In doing this, the academic quality of an entrant must be judged on his first degree results, but after that the question of personality becomes very important.

Most information work has taken place in the fields of science and technology, but it is now spreading to economics, social science and other subject areas. Whatever the main subject in question, the work is certain to spread over a much wider field. The information scientist, in most branches of the work, must be ready and interested to deal with such related subjects. He should in fact have some interest in acquiring knowledge for his own enlightenment and continuing education. In some cases, candidates having taken a first multi-subject degree may be better than those with a narrow specialization, but it is more a matter of the temperament of the student than of his initial studies. It is a question of his having an inquiring mind and well-directed curiosity.

For many tasks of dissemination of information, the work entails loose collaboration with the user, in research or development work or in management. In addition to an adequate breadth of knowledge there must therefore also be an interest in progress. Too many people become incapable of further learning after the initial effort of an education, and the liveliness of mind required can be maintained only by a continuous process of learning and the willingness to study in order to learn. It may be evinced by eagerness in discussion and the quick grasp of new ideas.

Many types of information work require direct contact with people who are the users of information. It is necessary to be able not only to be able to speak to the users at their own level, but to be able to inspire their confidence in the information scientist's ability to provide accurate information. It is often necessary to be able to question the user minutely in order to discover his real needs. This direct-contact work calls for an ease of manner and of speaking, but also for tact and patience - all marks of an extravert personality. Shy, reticent and inarticulate people will be unsuitable for such tasks. Perhaps, also, a degree of self-confidence and even a little dogmatism (provided the information given is correct!) may be an advantage, but it must not be pushed to the point of becoming intolerant, biased, or incapable of admitting error. Accuracy of information is of course an essential factor.

Similar considerations apply to liaison work, in which information workers may take their knowledge directly to the user at the factory bench or at higher levels. For such work, the contacts with people is one of the satisfying features of the work. Again, an extravert personality is important.

For those whose task is mainly that of using and searching the literature, other characteristics are necessary. The ability to read quickly, together with rapid comprehension, helps greatly, and such skills can be improved by training. There in also a rationale of reading which gives the worker an eye for essentials, for seeing quickly the important parts of a given paper. Reading need not then be done meticulously from line to line in the first instance; a scanning of an article will, with practice, reveal the scope of the paper more quickly; again, this can be acquired by training, and is especially useful when abstracting is undertaken. Where much foreign literature is to be examined, there is, in addition, no substitute for a fluent reading knowledge of at least one, preferable two or three, foreign languages.

Where the work extends to writing, for example abstracting, or the preparation of reports, good handwriting (if only to assist the typist!) and good style in one's own language become important. Furthermore, a sound logical approach to writing about subjects imparts meaning to the user more readily; good reports are those which are logically set out. For abstracting, where information is to be imparted in a condensed style, a logical order of presentation (aim of the paper, means of achieving the aims, results and conclusions) aids the reader to scan the abstracts and more quickly grasp their relevance to his needs. In all cases, logical thinking is an important perequisite to logical writing.

A clear logical mental approach is of course also necessary in advanced work with retrieval systems. Classification and indexing are exercises in logical thinking. The use of computers has increased the need for such clear approaches to problems, since systems design and systems analysis involve mainly logical principles. The computer is however only a machine, and its efficient operation for retrieval purposes follows from the efficiency of the system and input organization. Retrieval methods are not yet so good that one can afford to be complacent, despite the persuasiveness of the new type of middlemen who buy data tapes in order to sell selected outputs. More effort in studying and improving retrieval methods is needed and the information scientist needs to retain his critical faculties in this field.

This leads naturally to the consideration of research in information science by information scientists, an activity which has fluctuated over the years, owing to lack of consistent support, and which is now at a relatively low ebb. Research, as in other fields, should be undertaken only by those who have the flair for it, and the other necessary qualities (patience, clearthinking, intellectual ambition). Ability to undertake research has to exist in addition to a good grasp of the whole field, the latter can sometimes be achieved by good education, but practical working experience is a useful adjunct. There is a need to encourage research, and hence to discover those information scientists who may have the correct abilities. One test may well be a demonstration that the candidate has a clear understanding of research methodology, the ability to perceive possible new relations between observed facts and to design experiments, especially the crucial experiments, which will test a possible hypothesis, so that proof or disproof, when achieved, will provide the basis of the next step to be taken. Good research capacity is however a rare gift. Without basic research, however, information science cannot achieve the integration and progress necessary to establish it as a science in its own right.

It will be seen that the desirable characteristics of an information scientist are many, and their combination will be rare, fortunately, specialization and the division of tasks makes it possible to require only some of the characteristics at one time in one person. In the field of education, however, students have all to learn and all varied skills to develop. Unless courses are divided into specializations, the future possibilities of each student have to be considered and some attempt made to develop persons on an all-round basis. One can at least say that the number of posts into which diffident, shy personalities, with a limited range of interests, will fit will be small. In general, one must look for that touch of enthusiasm, perhaps for that sense of excitement for what is often a sort of detective work in tracing information, the trait of persistence and, above all, a respect of accuracy. It is the task of education not only to impart facts and skills, but, in this field, to cultivate the desirable personal characteristics and broad outlook. Training needs to emphasize the communication aspects of information science and the importance of personal contacts. Finally, the whole subject is still very much in the development stage; it is a field still very much in need of pioneers. Education should endeavour to awaken such ambitions in all students.

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EXPERIENCE IN THE FIELD OF RADIO AND TELEVISION DOCUMENTATION

by
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The paper illustrates the main lines of documentation activity at the RAI, with specific reference to the automated and integrated system based on the use of key-words, recently adopted for audio, visual and written material in the journalistic area. It also provides an extensive report on studies on the professional characteristics required of documentalists, the possibility of aptitude tests in their selection and data on the professional training courses currently given.

RAI — the Italian Radio and Television Agency — has in recent years tackled the problems of documentation with the utmost decision, conscious of their importance for the purposes of production and research on a vast cultural and social scale.

To this end, the improvements gradually made in RAI's filing systems have concerned not only the procedures of information classification, storage and retrieval, but also the institution of *a unified, coordinated system* of processing sound, visual and written documentation.

Interpreting the documentary function and all the connected technical and organizational requirements on a unitary basis, the conceptual centralization of all documentation activities has thus been effected, with considerable advantages at both management and retrieval level. This, while leaving operational autonomy in each sector unaltered, ensures homogeneity in the criteria of classification, presentation and retrieval of documents or varying origin.

The intergrated automatic documentation system today in force is therefore covered by a common system of rules, the essence of which is represented by the use of key-words that are perfectly compatible with the needs of the different archives. While appropriate developments of the system are forecast, for the time being it is applied for material of predominantly journalistic interest, including records and magnetic tapes (the « Registroteca » of the News Service), films (the

« Cineteca » of the TV News Service), and daily newspapers and periodicals (the « Emeroteca »» of the Press Documentation Service).

In each of these sectors, groups of documentalists are used who have received training in special professional courses.

Although the material supports from which information is obtained — and which for sound and visual documentation imply the uses of gramophones, tape recorders and moviolas — are different, the working criteria, i.e. the criteria of selection and classification of the various documents, are basically the same. In fact they consist in listening to or viewing the complete services broadcast in order to obtain therefrom in a first phase an accurate analytic, written description and, subsequently, a meaningful synthesis of the various information elements, based on key-words and on a number of supplementary content indications, which together with technical data, help to broaden knowledge of the document. In the case of written documentation, naturally there is direct compilation of the summary.

Certain other points are common to all three sectors: the machine processing of the data, all registered on punched tape; the electronic processing of the information, which *inter alia* gives rise to the printing of separate alphabetic key-word permutation catalogues (called Kwic Indexes); and control to keep up the efficiency of the integrated documentation system.

These explanatory notes regarding the documentation activity performed by RAI can make it easier to understand the more specific topics that interest the Conference. These refer to the selection and professional training of documentalists, and in a sincere spirit of collaboration, well aware of the utility that can emerge from an exchange of information on this subject, hitherto with such a dearth of traditions, an attempt will be made to give every possible information based on the experience directly acquired.

It must be pointed out that the selection of documentalists, regarded as an essential stage conditioning the ensuing training process, has been accorded considerable importance by RAI, with fairly broad theoretical indications on the professional background of those to be assigned duties and with appropriate selection tests to provide a concrete idea of the candidates' real abilities.

On the first point, the overall requisites are formulated as follows:

1. *Sex*

Other general characteristics being equal, females are preferred.

2. *Age*

Not important for selection purposes, since persons of various ages can possess the necessary aptitudes.

3. *Educational level*

University entrance standard (school leaving certificate). A knowledge of foreign languages (English and French in particular) is preferred.

4. *Non-Scholastic preparation*

Broad-based, active interest and constant curiosity in events and aspects of daily life in the various fields (politics, economics, sociology, arts, sciences, entertainments, sport, fashion, various events). The resultant good standard of information appears closely related to a regular utilization of the mass media and, particularly, the systematic reading of newspapers and periodicals.

5. *Personal Characteristic*

The duties concern a subject based on several fields. It is therefore necessary to have considerable mental agility and the ability to concentrated one's attention tenaciously, even for long periods, on the information material in questoin, to be able to grade and classify it appropriately and homogeneously, according to instructions. Consequently it is necessary to have considerable responsibility for one's own work, since the characteristics of a documentalist's work make complete control by a superior impossible, unless the latter redoes all the work.

In this framework, the following mental aptitudes are essential:

- Coherency and rigour in reasoning (a logical mind).
- A good memory and, for work in the Film Library, also a good visual memory.
- A high standard of objectivity and balanced judgment.
- Ability to assimilate correctly both general and particular regulations, even complex ones.
- A flair for analysis and the capacity to summarize, concretely expressed, in the ability swiftly to pinpoint, extract and faithfully coordinate in a few terms, using special keywords, essential information items in visual, sound or written documentation.
- A thorough mastery of the vocabulary, with particular knowledge of synonyms.

Apart from anything else, it is obvious that one who « participates » is most suitable for the job of documentalist, i.e. one capable of expressing a direct, continous interest in his work, which is essentially sedentary in type and calls for the following qualities: patience, orderliness, method, precision and conscientiousness.

The reason for the selection tests mentioned — which, however, for particular reasons, have not yet had any practical experimentation — stems from the need to examine the basic aptitudes of aspiring documentalists at an early stage, in order to secure admission of the most likely candidates to the training course.

This procedure was in fact intended to discover, by and large, the suitability of the candidates especially regarding: standard of knowledge, mastery of vocabulary, memory and attention. In practice, *five short functional tests* have been worked out. They are all written tests, to be answered in a reasonable period of time, with the proviso that some of them might act as eliminators for subsequent tests. They are briefly described below.

Test 1 - Indicate the exact definition of 30 words of more or less common usage, and therefore applicable to the system of documentation adopted, choosing from a list of 5 definitions, of which one is right and four wrong.

Test 2 - In a list of 20 words, find 20 opposites, choosing from a series of 7 terms, only one which will fit.

Test 3 - Answer 40 questions on basic items of knowledge and various topical subjects (domestic and foreign politics, economic, industry, tourism, sport, literature, films, theatre, etc.).

Tests 4, 6 - News items — without heading and sub-heading — are clipped from a daily newspaper and photocopied. These are about international politics, domestic politics, crime, social events, sport and entertainment. 3 of them are selected by draw, and candidates are invited to pick out the focal points of each item, by choosing the *8 most significant words* from the text and entering them on a special sheet, enabling the contents to be reconstructed in summary but essential form. This technique is that adopted in practice by documentalists in summarizing various documents.

Test 5 - This test concerns the specific requirement of the Film Library, but at the same time can be applied to the other sectors of work. From a series of *30 slides*, it is required to recognize the people, landmarks and objects portrayed.

For the sake of simplicity, not all the criteria proposed to appraise the results are specified here. Points are assigned for each test: 1 or 2 points for correct or acceptable answers, and even ½ point if foreign names, for example are spelt wrongly. If the examination is based on the principle of progressive elimination, there is a pass limit of at least 60% of the maximum points in each of the first three tests, and of the first four tests on average, while $^{1}/_{3}$ of the questions of the photographic test must be answered correctly.

At all events, a final *talk* is recommended, to round out the examiner's judgment as to the specific qualities asked of documentalists, both educationally and regarding personality. Naturally this talk would be decisive for purposes of final assessment.

It now remains to examine the principles followed in carrying out the courses of professional training for documentalists. Such courses have already been arranged three times with few formal variations, in the sense that, while the doctrinal and practical content has remained as it is, special instructions have been given from instance to instance according to the specific sector for which the personnel are intended. For example: types of films, use and functioning of moviolas, structure of TV reporting services, terminology of press journals, formation and editing of news for Newscasts, etc.

Otherwise, the subjects dealt with have always been related to the need for serious instruction in the general and particular norms of documentation in the overall context of methodological and linguistic aspects.

It would be superfluous to give all the connected details here. Suffice it, therefore — and also in view of the informative nature of these notes — to indicate by way of example some of the subjects that have been dealt with in the RAI courses, which are to a large extent run by internal teachers and which are generally completed in *6 weeks*, of which 4 are devoted to theoretical-practical training and 2 to exercises in:

— Documentation and information.
— Phases of documentation activity.
— Principles of classification and cataloguing.
— Key-word classifying.
— Language problems.
— Rules for analysis and summarizing.
— Relations between documentalists and users.
— Electronic data processing.

The last course, which was held in the summer of 1971 for an intake of 6 new documentalists (out of 20 persons available), comprised about 75 hours of lessons and 100 hours of practical work. The results achieved, in the commitment of the participants and their subsequent job output, were by and large certainly positive.

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AN INTEGRATED APPROACH TO SUBJECT AND PROFESSIONAL EDUCATION

by
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An Information Specialist must have an adequate knowledge of techniques if he is to exploit the information he gathers to the advantage of his users. He must also have some idea of the kind of information they require, and an understanding of how they use it. The honours degree course offered jointly by the College of Librarianship Wales and the University College of Wales Aberystwyth gives the student the basic background he requires in both these areas, and shows how the professional and the subject approach merge in the study of subject bibliography.

Is is well known that there are two approaches to the profession of information work: one can either start out as a professional and acquire subject knowledge, or one may begin with subject knowledge and acquire the professional expertise needed. Neither of these methods is entirely satisfactory. In the first place, the information worker tends to lack the basic understanding of the subject field which enables him to make contact with the clientele he should be serving; in the second, all too often the expertise is taken for granted as a triviality and the information worker in consequence provides a less adequate service than he should.

At the College of Librarianship Wales an attempt is being made to provide an education which will give the student both sides of the picture, thus enabling him to fit that much more satisfactorily into the world of information work once he has graduated. The course concerned is a joint honours degree of the University of Wales leading to the Bachelor's degree in librarianship (B Lib.). Though the course is mainly directed at the 'conventional' library qualification, the choice of optional subjects and the breadth of the overall professional coverage, together with the integration between the professional and the subject approaches, all mean the course is one well suited to the training of information workers.

Part I of the course occupies the first year. During this time students follow two academic areas of study together with foundation studies in library and information science. The most interesting and unusual area in the latter is perhaps the course on the « Organization of knowledge », in which the student is introduced to many of the semantic and logical problems inherent in the transfer of information. This course is one of an increasing number of attempts to broaden the student's horizon beyond the conventional « organization of knowledge in libraries » which has formed part of similar courses for many years. The overall intention of Part I is to introduce the student to both academic and professional studies and to demonstrate that the two are not separate but closely related.

Part II occupies the following two years, and here again the student pursues his studies in three areas; these are however slightly different in content and emphasis. Only one purely academic course is followed, but this is in the depth required for an honours degree and involves the student in a high degree of discipline and independent study. The second area is that of professional studies, which will be discussed at more length below. The third area is a very important one; in this, the student studies the bibliographic organization of his academic subject and explores the subject from the point of view of the information worker. This integrative study is perhaps the key area, for it is here that the student can see most clearly how information is organized (or not organized) in a subject with which he is familiar and gains an acquaintance with bibliographical tools and structure in a real environment rather than the usual somewhat artificial one. Not only does this study illuminate the theoretical professional studies he is pursuing, it is of significant value to him in the academic area that he is investigating. (One could remark in passing that most undergraduate students are woefully ignorant of the bibliographical structure and organization of their academic field to the extent that a first class honours degree in physics may still leave the graduate unaware of the existence of « Physics abstracts »).

For his professional studies the student has to take three core courses. These deal with the principles of management, of bibliographical organization, and of information retrieval. In each case the basic principles are discussed and may be applied to a wide range of cases, so that the course is not by any means restricted to « conventional » library situations. Modern techniques of information retrieval are given equal weight with more traditional methods, which of course the information worker may well need to understand and use.

The student also chooses two optional courses, each lasting a year. These are intended to emphasize the particular area of special interest which the student wishes to follow up; for the potential information worker there are such courses as « The methodology of research and its presentation » (described in more detail in an accompanying paper) and « Computers and mechanization in libraries » in which the student can learn how mechanization can be of help to the information worker and also learn something of its limitations.

In all these courses, stress is laid on the importance of the active rôle of the library and information service and the way in which it can play a significant rôle in the information transfer process. The student is introduced to the idea of formal and informal networks of communication, the rôle of the technological gatekeeper and of the information worker as a member of a team rather than as an individual outside the clientele he is serving. The image of the librarian as one who plays a passive rôle and serves but does not take part in the work of his clientele is one that is strongly discouraged.

The combination of academic and professional study is one that has proved very successful in practice. Graduating students do not regard themselves as narrow professionals, but have had an introduction in some depth to the academic world. The other side of the coin is of course that they leave the College with a considerable understanding of how bibliographical studies interact with a subject field and how to apply their professional expertise in an area with which they are familiar. This may not be the area in which they eventually settle down, but the important fact is that they have acquired the integrated way of thought. It is to be hoped that this kind of course is one which will be increasingly important in future training in information work.

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THE METHODOLOGY OF RESEARCH AND ITS PRESENTATION

by
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This course, which is one of the options available to students taking either the Joint Honours undergraduate course (B Lib) or postgraduate diploma course (Dip Lib) at the College of Librarianship Wales, sets out to give students some understanding of the context within which research takes place, the problems in communicating the results of research, both intellectual and logistic, and the place of the library in the research environment.

One of the more important rôles of the information officer is to fit into the research environment, providing research workers with the information that they need, but also serving as the channel through which research results are disseminated outside the group. It is clearly impossible for him to discharge either of these functions adequately unless he has a satisfactory understanding of the research environment: how research is carried out, what are the needs of those engaged and how are the results best brought to the attention of a wider audience.

It is therefore perhaps a little surprising that in general this important area of study has been neglected in the education of information officers. A few schools have included courses on research, but these have in general been research in library science or documentation, rather than research at large. The course in the methodology of research and its presentation currently offered to students at the College of Librarianship Wales as an optional paper is an attempt to remedy this defect. It has now been offered to two sucessive years of students and the experience gained has proved invaluable in modifying the outline and changing emphases, but the overall approach has proved that it can stand up to practical application well. The objective is not to turn the information worker into a research worker himself — although it would provide suitable background for anyone wishing to undertake research in documentation — but rather to give him some insight into the problems of information transfer that are likely to be encountered by his potential clientele.

The course falls into two related but separate sections, representing the theoretical and the practical sides. The theory is covered by a series of lectures and seminars, while the practice involves the student in the preparation of a research proposal. It would obviously be desirable to involve the student in some small scale research, but the time factor militates against this; the planning of a research project is as far as we have succeeded up to now in positive involvement, but it does seem to give students a reasonable grasp of the problems involved and some of the projects submitted have been very good.

The course begins with a series of sessions in which students are introduced to the *context* of research, i. e. the way in which research is related to the individual research worker, but also to the institution within which he works and to the wider national and indeed international environment. There is some emphasis here on science and technology, reflecting the fact that research in these areas is usually more tightly organized and on a larger scale than that in the social sciences and humanities, but the latter are not neglected, since they present their own particular problems. There is also some emphasis — as might be expected — on Great Britain and the United States, but other countries are included, particularly if they offer a contrasting structure, as does the USSR. Case studies are discussed in seminars and political and financial implications are taken into account (for example the problem of finding a site for the big new West European particle accelerator and of persuading national governments to give adequate support). The students involved have all pursued their studies in an academic discipline and as an essay topic they are required to investigate the context of research in this subject.

From the context of research the student progresses to the study of research methods, including the statistical approach, design of experiments and the evaluation of results. Since this is a course intended for documentalists, the importance of the preliminary literature survey can be emphasized, in the knowledge that the student will already have acquired the basic techniques of bibliographical searching. It is also essential to include such techniques as the design of questionnaires, since much social science research is inevitably concerned with the gathering of already existing data rather than the experimental production of new results.

In parallel with this section students are given a rather detailed introduction to research in library science and documentation, in which the general discussions of context and methodology can be related to a specific subject area with which the student has some familiarity. This introduction serves as the basis from which the student can begin to work on his project. Project work is all done on a tutorial basis; a topic is selected in collaboration with the tutor, who then advises the student and monitors his progress in a series of meetings.

From his study of methodology the student moves forward to the problems of communication. These are studied from two rather different points of view: firstly, the logical and psychological problems of presenting the results of new work to a potentially hostile audience and of persuading that audience of the validity of the work; and secondly, the various media through which the information may be presented, both formal and informal, written and oral. In the first case, the difficulties involved in presenting a logical and coherent account of a piece of research which will almost certainly not have followed such a clear and coherent pattern may be discussed, while in the second case the relative merits and demerits of conference papers as a means of disseminating new ideas may be considered. These discussions will also link up with materials which students should already have gathered from other courses and help to put these into a new perspective.

Finally, the student considers the rôle of the library (taking that word in its widest sense) in the research environment, and the relationship between the formal networks involved in the transfer of information and the other, less formal but possibly more significant, networks through which research workers gather the information they need. The rôle of the technological gatekeeper is one which has now been sufficiently identified for it to become almost part of the formal network. A rather different set of problems is posed by the development — or perhaps I should say at present the *potential* development — of large scale on line computer based information retrieval systems; as yet the implications of these are not clear, but obviously the student who will be working in the research environment during the next few years will need to have a lively appreciation of the shape of things to come.

The course thus endeavours to give students some idea of the present situation and possible future lines of development. One of the important objectives is to indicate those areas in which conventional library and information services tend to fail the research worker and to persuade the student that the documentalist can learn from these past failures in order the better to serve his clientele in the future.

For biographical note see p. 171.

THE NEED TO TRAIN DOCUMENTALISTS FOR THE ACTIVE PARTICIPATION OF DEVELOPING COUNTRIES IN INTERNATIONAL INFORMATION NETWORKS

by
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The increasing volume of published and unpublished literature has resulted in the development of new documentation techniques requiring the utilization of trained documentalists. Two main series of action are described as part of the international cooperation engaged in favour of these developments: first, the setting up of study groups for the evaluation of different information systems and the standardization of the methodology involved; secondly, the creation and implementation of international information networks. A broad outline is given of one of these networks: the « International Information system for agricultural sciences and technology » (AGRIS), the study of which has just started under the aegis of the FAO of the United Nations. The participation of developing countries in the above mentioned networks is then studied with particular reference to AGRIS regarding the input and output contributions expected from regional and national centres constituting the network. Among the conditions governing this participation, the neeed for training documentalists stands out as a very important one and it is proposed that regional training centres be established in order to ensure manpower requirements.

A. *Introduction*

We are at present witnessing a considerable increase in scientific and technical literature. Its volume cannot be estimated precisely, but the documentation of a number of large world libraries can provide an approximate idea of it.

According to Sicking and de Walden, Moscow, for example, possesses 20 million books, Washington and Leningrad about 12 million each, London, Paris, New York and Cambridge (Mass.) about 6 million each, and this without taking into account periodicals, print-offs, brochures, reports, catalogues, etc. The number of scientific periodicals published regularly is about 50,000, representing a total of some 20 million pages.

Especially in the field of agriculture, forestry and fisheries, we estimate that the annual volume of literature published lies between

150,000 and 250,000 documents. Not to mention unpublished literature which is considerable particularly in the majority of developing countries where means of publication are limited! We estimate that over the past few years about 10,000 documents of this type have accumulated in each of the some hundred or so developing countries, which adds up to a total volume of one million documents containing unexploited valuable information. To this should be added that produced in developed countries by the research institutes, the universities, professional organizations, the private sector, etc.

To be able to deal with this crushing volume of economic, scientific and technical literature, documentation has become a necessity of our time. As defined by the French Union of Documentation Organizations (UFOD), this is « the establishment, research, collection and using of documents ». While it is not yet looked upon as a science properly so termed, since it creates nothing, it has its doctrines. To many it is a technique, for it makes use of an impressive number of mechanical and photographic techniques which take place at a high speed. It also makes use of more intellectual techniques such as those of catalography and classification, and the ensemble of these techniques constitutes a methodology of the documentalist's profession to the extent that they form a co-ordinated whole.

The rôle of the documentalist is thus to « document », which task the International Federation for Documentation has defined as « collecting », classifying and using documents of all sorts, in every field of human activity », and which assumes that certain conditions are met by the one who performs it.

First and foremost, an educational (cultural) scientific or technical specialization in which he will perform his documentary functions; next, a theoretical and practical knowledge of documentary techniques and of the equipment connected therewith; and finally, an impartiality regarding the content of the documentary collection and the aptitude to make a selection from it according to its intrinsic value, on the one hand, and the specific requirements of the user, on the other hand.

It is a recent profession but it has progressed considerably in the last few years. University-level courses in documentation date from 1950 in France (at the Institut National des Techniques de Documentation), from 1961 in England (at the City University, formerly the Northampton College of Advanced Technology) and from 1963 in America (at Drexel College of Technology). The subject and the technique are developing at such a rate that standards of education in this field have constantly to be updated.

It is interesting to note here the following few problems, which are emphasized by Farradane in his paper at the Forty-Second annual conference of ASLIB, held in Canterbury in September, 1968:

1. The lack of adequate teaching manuals which should supplement the specialized works which are becoming more and more common,
2. The insufficiency of practical works particularly concerning efficiency tests for different indexing and document research systems,
3. The more and more pressing need for intermediate level documentation courses to train qualified executing personnel,
4. Official recognition of this technology as a real university science and not as an amalgum of applied techniques.

The author of this paper concludes that only when documentary science has been fully established as an academic discipline will we be able to count on the hoped-for co-operation of other scientists in developing our knowledge of this field.

B. *International co-operation and international information networks*

Alongside the efforts aimed at improving the professional position of the documentalist, ensuring that he receives higher training equal to that offered to other economic, scientific and technical professions, we are at present witnessing a profusion of independent efforts in the area of documentary methodology, aiming at harnessing, channelling and using the flow of information pouring in from the numerous disciplines of knowledge.

It is clear that only well-arranged international co-operation can permit these efforts to be co-ordinated and attain final success, and this through two main series of actions:

1. The setting up of study groups to study together the component parts of various documentation systems, the methods of their application and linked problems of compatibility.
2. The creation of international information networks, their administrative and technical organization and their functioning.

In the framework of the former series of actions we may quote, *inter alia*, the following few initiatives:

a. the joint study by specialized agencies of the United Nations of the problems connected with micro-reproduction and indexing of documents.

b. The preparation and publishing by a group of international organizations including FAO, BIT and OECD, of a first « common list of descriptors » covering the field of economic and social development. Subsequently other bodies contributed to this list, with the result of the coming publication of a macro-thesaurus of terms of general interest, corresponding to the specialized thesauri of the various contributor bodies.

c. The numerous documentary activities of the International Federation for Documentation regarding meetings and publications.

d. The initiatives taken in America and England for the standardized numbering of books, particularly concerning ISO (International Standard Organization) and OECD.

e. Lastly, the major contribution made by UNESCO, which plays an active part in the promotion of documentation in the world, its main contribution taking the form of:

— the publication of specialized works and guides,

— the technical assistance so far given to certain countries in organizing their study and cultural libraries,

— its recent agreement with FAO on close co-operation of these two bodies in setting up and operating national documentation centres in developing countries.

The latter series of actions is merely the logical continuation of the former. It is characterized by the development of international documentary networks based on mechanized documentary systems produced taking account of the conclusions and recommendations stemming from the former series of actions.

In general, these documentary networks are based on the co-operation of several centres providing the input, or again on the sharing of the different operations required for the processing of information. In recent years various networks have been set up, including:

— MEDLARS and EXCERPTA MEDICA, in the medical field

— INIS (International Nuclear Information System)

— IFIS (International Food Information Service), regarding food technology.

Among the most recent initiatives, I will mention three:

— first, the international network called « World System of Scientific and Technical Informatoin », studied by UNESCO, (UNISIST);

— the network envisaged within the framework of AGRIS, « International Information System for Agricultural Science », at present under study, under the aegis of FAO, by a group of experts which met in July 1970 to formulate its first recommendations on the proposed system. This group, in January 1971, studied a plan of action envisaging the study and testing of the system in 1971, and its application in 1972.

For this year's programme the group of experts has formed three working parties assigned the job of studying the various aspects of the system. These working parties have had many meetings already, and a joint report is at present being prepared, to be submitted at the coming meeting of the group of experts planned for next month in Rome.

Subject to possible modifications which might emerge from the final conclusions and recommendations of this meeting, AGRIS as defined to date and communicated by M. Dubois, secretary to the group of experts in question, at the Sixteenth Conference of International Organizations for the Joint Study of Plans of Activity in the field of European Agriculture, held in Paris last January, will have a two-tier structure, organized as follows:

« 1. Level One: A global documentary service, able to supply current information in all the areas of FAO's competence.. This service should ensure:

a. the periodic publication of a series of current bibliographies, arranged according to field and sub-field;

b. the supply of special information upon request, including copies of documents cited, which cannot easily be obtained by the usual methods. At the same time, « Level One » should, through a single, co-ordinated effort, lay down a common basis which could be used by the specialized Documentation Centres which will constitute « Level Two ».

2. Level Two: a network of specialized services which can include specialized Information Centres, Documentation Centres and Data Banks, assigned detailed documentary functions in their respective fields (analysis, indexing, summaries, synopses, translations).

The envisaged organization of « Level Two » will be based on national and regional input centres which will — each for its own geographical area — catalogue all new documents following a standardized procedure. The information thus produced (with microcopies of non-conventional documents) will be centralized for processing and the preparation of current bibliographies, according to the field and sub-field mentioned earlier. These bibliographies, in printed form, or on tape, will be available on a global or selective basis for all Documentation Centres and in general for the user public. The same centres serving as input for the System (Level One) will thus be able to benefit from the ensemble of information collected by the network, and to distribute it in the form which they consider most fit, to their own national clientele. The centres now being set up in developing countries would gradually figure among these national Documentation Centres.

Regarding Level Two, and although studies on the subject are not yet very advanced, one can glimpse that it will be organized on the basis of a group of specialized centres according to discipline, field or sub-field. In each group, the specialized work (analysis, indexing, summaries, etc.) will be distributed in order to make use of the various competences and to avoid overlapping »...

Lastly, particularly with reference to agronomic research properly so termed, the results of the study of which will of course be important documentary inputs for AGRIS, FAO is studying the possibility of establishing in parallel an international information system to process data of all types on research projects in progress in the world.

This project, that has been named CARIS (Centralized Agricultural Research Information System), will be designed to collect, organize and distribute basic data on agricultural research institutions, programmes and activities under way in and for the benefit of developing countries, in such a way as:

— on the one hand, to improve communications among institutions and among researchers,

— on the other hand, to permit the evaluation of research projects under way and the identification of their major gaps and weaknesses in order to arrive at valid decisions at international and national levels.

The CARIS project will be subject to the approval of the advisory group on international agricultural research and envisages, within not more than two and a half years, the production and publication of a first agricultural research repertoire containing the necessary details on studies underway in the world.

C. *Participation of developing countries in international information networks*

It is quite clear that the existence of such international information networks in the different sectors of economic and social development, on the one hand, and in the various disciplines of pure and applied science, on the other hand, should permit an absolute control and thereby also the rational using of the economic, scientific and technical literature which is at present flooding libraries and documentation centres. However, we cannot be unaware that these networks will not operate efficiently unless they have the active participation not only of the developed countries, but also of the developing countries.

How should the participation of the latter manifest itself in the special context of AGRIS, for instance, and under what conditions will it be not just active but also effective?

I am going to try to answer at the same time these two questions — how and under what conditions? — in the framework of two aspects of the system and in the light of the latest recommendations of the working sub-party studying its structure and organization, naturally on the reservation of their adoption by the group of experts next October. These two aspect are the input and the output.

To the majority, AGRIS would by preference be a centralized intergovernmental, international system with, however, certain aspects of decentralization, particularly for input and output. The input would be ensured:

1. by a limited number of regional centres (five or six) responsible for a geolinguistic sector and which would catalogue, analyse and categorize published agricultural literature from a fairly wide choice of key journals. They would be responsible also for the preparation of taped data which would subsequently be used by a mechanized processing centre.
2. by a network of national centres which would concentrate on exploiting the unpublished agricultural literature of the corresponding countries, this having to be transmitted to the regional input centres in the form of *input lists*, perforated tape or magnetic tape accompanied by the original documents.

Two forms of output are recommended:

— a centralized form producing magnetic tapes and also printed bibliographies

— a decentralized form offering and producing services of selective distribution of information (SDI), special bibliographies, retrospective bibliographic research and clearing house services.

It is envisaged that the magnetic tapes will be distributed free to the regional input centres and by the latter to the national centres, but copies would be retained by the system co-ordinating centre, which could be FAO. The latter would be responsible for ensuring widespread distribution of the printed bibliographies, at a very low cost. It is thought, on the other hand, that the SDI services could be better assured by national centres with the co-operation of regional centres if necessary. The national centres would likewise be those most indicated to produce special bibliographies and to carry out retrospective bibliographical research, especially at AGRIS level 2.

Furthermore, the system envisages the partial decentralization of the clearing houses, at a regional scale, the regional centres thus possessing a full set of unpublished literature on micro-fiches.

With regional centres each supervising the documentary production of a given geolinguistic sector, there should be no problems for published literature. Against this, the input of unpublished literature of each country requires, on the one hand, the rational organization of collection and control points, and on the other hand the tracing and judicious selection of valuable items of information to be included in the system. As we see it, the network of regional and national centres, after contributing toward the input, would also become the output network and would use all the documentary collection stored to meet their own objectives and according to the special needs of their clientele.

It thus appears necessary and urgent for the developing countries to organize as of now their documentary infrastructure so as to be able to participate when the time comes in this international action within the framework of AGRIS.

The organization of this infrastructure has been under way since 1969 in the framework of the United Nations Development Programme with the joint contribution of FAO and UNESCO as executing agencies, the former limiting itself on a priority basis to the agricultural documentation of each country, and the latter to documentation relative to the other sectors of the national economy.

The technical assistance provided by the FAO documentation centre is based on a modern documentary methodology and covers services in personnel, equipment and training courses. The aim is to move progressively toward the installation and operation of a network of national or regional documentation centres in developing countries, in order to permit the latter to exploit their own documentation.

Sir Robert Jackson, in a study on the capacity of the United Nations development system, recommends that the setting up of these centres be speeded up so that they may thereby be included rapidly and easily in the organizations and agencies of the United Nations.

The first documentation technical assistance project, started in 1969 at Rabat by FAO's Documentation Centre, was both a success and an experience. It shed light on a whole series of difficulties which it was necessary to solve and which form the basis of this experience. This centre today functions with its own means following a methodology finalized by the Rome Centre, and guarantees the bibliographical distribution of its national agricultural documentation via a range of printed indexes of the same type as produced by FAO. We know that it is honourably pursuing its mission under the management of M. Fassi Fihri.

However, despite all these international activities in favour of promoting documentation in the world, the special efforts of FAO for the active participation of the Third World in these information networks through the intermediacy of national documentation centres still come up against administrative and financial difficulties which hamper them.

If the experience of Morocco has been a success, this is because we have benefited in this country from especially favourable conditions which have enabled obstacles to be overcome. The second project of the same type at present under way in the Senegal basin and covering the four countries of this basin (Mali, Mauritania, Senegal and Guinea) is being carried on under not very encouraging local administrative conditions.

Other developing countries interested in these documentary projects have submitted their official applications to the UNDP, but some are still hesitant about the questions of structure and financing. For the time being there are a half dozen such projects under negotiation, and which could get under way in the near future.

The time has come for developing countries to become aware of the need to organize their national documentation following a modern methodology compatible with those being developed at present.

AGRIS will be taking shape next year and the contribution of these countries in the system depends on the existence of a network of national documentation centres. These, however, can be selected only under certain conditions:

1. that they fill a central documentary function in agriculture in their country,
2. that they have easy access to the unpublished agricultural literature,
3. that they are capable of taking over the requisite documentary tasks such as cataloguing, categorizing, indexing, the selective search for information and finally the rapid distribution of this information to its users.

The first two assumptions are linked to the adequate location of these centres in the governmental or constitutional structure of the countries so that they may, on the one hand, benefit during their mission from sustained financial support, and on the other hand enjoy the trust of local agricultural organizations with regard to documentary productions not published by the latter. This commitment is at the basis of FAO's present documentary policy when it is a question of negotiating with governments for the establishment locally of national centres of documentation.

As for the third assumption, it is clear that the functions mentioned are linked with the problem of the documentary training of the personnel of the centres in question.

I said a word or two at the beginning of this report on the professional training of documentalists in general, quoting Farradane, but I lack more specific information on the present position of the profession in the world from the educational standpoint. But while the development of documentary education has manifested itself very clearly for some years now in the developed countries, despite the still very limited interest of the profession, the same cannot be said for the developing countries, where this activity is even slower and for the time being affects only some of the more advanced of them.

The Ali Bach Hamba Institute in Tunis is a rare example of a documentation training centre such as we would greatly like to see existing in other areas of the third world. Here I would like to make an aside to assure its Director, M. Taoufik Tabbane, of my great admiration and appreciation for his model organization whose activities to promote documentation are now well established and which we in FAO have noted as providing effective instruction in documentation for the staff of the Moroccan national documentation centre, in the framework of the fellowships provided for this technical asistance project.

If one takes into account the requirements needed for participation en bloc by the developing countries in AGRIS via their national documentation centres, following the third assumption formulated earlier, it would mean having, quite quickly, a team of several hundred qualified documentalists.

We would very much like to see a regional network of training centres supplying specialized personnel not only to the national centres but also to the regional input centres, thereby guaranteeing useful co-operation at two levels on the professional plane.

Furthermore, given on the one hand the diversity of documentary duties properly so termed, and on the other hand the diversity of the economic, scientific and technical disciplines for which the requirements of documentalists are becoming more and more felt, a training programme at two levels can be clearly envisaged:

- at a higher level, covering full instruction in documentation but applied to an economic, scientific or technical discipline, in which basic instruction would be given at the same time
- at an intermediate level, limited to full instruction but of a more practical type, in documentary techniques.

Thus we would have two sources or recruitment: the one would supply qualified personnel of the first level, for management or command functions in the documentation centres; the other would supply qualified executing personnel, necessary for the practical performance of these duties.

D. *Conclusions*

This brings my speech to an end, and I must perhaps apologize for its digressive nature. I would like to conclude with the hope that the developing countries will realize that the essential rôle of documentary activity expresses itself ultimately in efficient and ever-expanding educational work. The modern methods controlling documentary techniques enable those whose position compels them to keep constantly abreast of progress not to be overtaken brutally by the onward march of science towards new applications. This masterful social function of documentation reveals all the nobility and the special requirements of the profession of documentalist.

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THE IMPORTANCE OF TRAINING FOR INFORMATION WORK IN THE ARAB STATES

by
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Developing countries are in great need of information units in all scientific fields. These units should draw upon existing experience and should be organized according to the most up-to-date standards.

The similarity of language, culture, needs, and degree of progress in the Arab countries facilitates the establishing of information training centres on a centralized basis. These centres should be responsible for: 1. proper selection of personnel; 2. preliminary and continuing training in current information procedures use of computers, preparation of abstracts, etc.; 3. co-operation between centres through the creation of regional, national, and international unions; 4. provision of experts from the developed countries and reciprocal exchange visits; 5. organization of conferences to improve information services.

The problem

The advancement of the developing countries depends on the fact that they have to:

1. Catch up with the progress in all spheres
2. Become a positive element in progress.

To achieve this, developing countries must start from the point that the developed countries have reached. In this respect the rôle of information is most important. To take off they must gather all the up-to-date information available in the various spheres.

This requires that the developing countries collect and abstract pertinent and suitable data for their developing process. The result of this is that these countries accumulate a tremendous amount of data which has been collected from different sources and languages and has to be selected, abstracted and disseminated regularly so that development projects can make use of other countries' experiments.

In the field of science for example, data must be collected on the ways and means and discoveries of other countries. This may be also applied to the field of Education. The developing countries should have comprehensive knowledge on all that relates to education in the developed countries as well as pilot educational experiments in the world.

All this should be at the disposal of those who plan for the future of the country.

If we take Qatar as an example of a developing country, we find that it has recently started to develop its human resources by means of education. It is noteworthy that the process of spreading education in itself does not achieve the aim of development but may lead to the opposite if traditional educational systems used by the world in the eighteenth and nineteenth centuries are repeated. On the other hand if emphasis is put on modern educational trends, and what is suitable for its development is put into use, then this country may start with the benefit of human experience, thus avoiding the same mistakes that the developed countries made.

This trend in human development could lead to the establishment of modern educational systems that avoid the mistakes of the past and push development ahead.

Accordingly small countries like Qatar would become a factor in the progress of the educational systems in the world, and could be used as a model of what modern science and technology can achieve in the fulfillment of rapid development and a better life.

With this same idea in mind, we can consider a country like the United Arab Republic which is faced with the problem of over population. This excess in population may be used as an investment to develop its resources to help rather then impede the country's progress. This requires the gathering of data from all countries that faced this problem and managed to overcome it and achieve a better standard of living, as for example The People's Republic of China and Japan.

The conclusion is that developing countries are faced with the urgent need to collect information and use it in every kind of human and materialistic development project.

It is here that the need of establishing information units in every research and planning department arises, each unit's duty being the gathering, classification, analysis and clarification of data for the development policy makers in every ministry, factory, company, organization or corporation. All these units should be linked by a central information unit where all the threads of knowledge are collected. The establishment of such units at present should not depend on the systems that were used in the past, as far as collecting data is concerned, but rather must originate with the most up-to-date systems so as to surpass the obstacles that may impede them.

For example when we establish a university library today in any developing country we should not follow the systems used by the developed countries, as their university libraries were affected by the era in which they were established and were then progressively modified throughout their long history. This would be unsuitable at present, and could impede modern progress. It is more suitable today when establishing libraries in developing countries that they be organized in such a manner that in addition to their usual rôle, they act also as an information media to the teaching staffs helping them follow the progress of their specialized fields.

Likewise, when establishing information units in developing countries, they should be begun by applying the most up-to-date methods in collecting and gathering data and also follow a suitable scientific and technological system in information.

In a few words, the developing countries greatly need the establishment of information units in all scientific fields. These departments should be organized according to the most modern standards and should profit by all the progress achieved in science and technology. This means that it is essential to train the personnel in these departments with the latest trends in information science and technology.

Training

Trainees should be selected from university graduates or the like and should be trained in the latest techniques in office work, documentation, etc.. In some developing countries it is difficult to find an adequate number of university graduates that can be appropriately trained, hence they ought to be selected even if they are not technically qualified to benefit from the resources available in other countries. It is also possible to select persons who are employed in the field of information, though unqualified, but have experience in the field. Here it is imperative that they be trained scientifically to face the problems that they may encounter in the sphere of information.

Briefly, the selected candidates should be of a high cultural standard in their field of specialization connected with the information they are collecting. For example if the information unit is educational it must select its trainees from university graduates in the field of education, taking into account also their linguistic abilities, especially English and French, which are great assets. Some developing countries may not be able to undertake alone the training of personnel in the various fields of information due to the shortage in number and the high costs which do not correspond with the results. Here it is better for these countries to co-operate in preparing seminars in which several countries participate and also to co-operate with specialized international organizations and developed countries in training and organization.

With regard to the Arab States it is easy to establish training centres of this kind due to the similarity in language, culture, needs and progress. This facilitates the distribution of information training centres among the different Arab States and accordingly these centres select in each training programme candidates from all the Arab States who are to be trained simultaneously. An example of such a centre is the Documentation Centre for Education in Cairo, which can train personnel from the Arab States in the field of educational information according to a five-year plan and prepare them for handling educational information. This is possible through the co-operation, financing and consolidation of the Arab States and UNESCO. The same also applies to the Documentation Centre for Science in Cairo, as it can likewise be transformed into a regional documentation centre that prepares scientific documentation in the Arab States.

It is advisable in training to use computers and bulletins, publications, magazines, abstracts and the like that deal with the flow of information.

Training also requires the organization of information departments that are up-to-date with all that concerns information. In this respect it is also advisable to provide such centres with experts from developed countries to help in the exchange of opinions and the correct process procedure. Meetings should be held every now and then for the trainees to discuss their problems as the field of information is new and progressing. Exchange visits should be arranged likewise with centres in developed countries. It could be of value to arrange a conference every five years that embodies representatives of information personnel in developed and developing countries to study the problems that face their work and to organize means of publicizing and exchanging information between these countries and different organizations.

The establishment of international, regional and national unions for personnel in this field, regardless of their specialization, is of great importance in the development and stimulation of the scientific trend of this movement.

In brief, the training process embraces:

1. The proper selection of personnel
2. The preliminary and continuous training in the most modern procedures.
3. The organization of co-operation between centres by establishing international, regional and national unions.
4. The exchange of visits to information centres between developed and developing countries.
5. The convocation of conferences every now and then to exchange experiences and to co-operate in solving problems that may arise and to organize the flow of information exchange.

Here arises the importance of the rôle played by the International Federation for Documentation (FID) in organizing and arranging conferences, and selecting the appropriate subjects for these meetings in the developing and developed countries with the co-operation of international organizations, and publishing the recommendations of these conferences.

Conclusion

The developing countries and in particular the Arab States due to the fact that they share a common language and culture, are in need of a regional centre for information. This centre in the Arab States is to be established through the co-operation of the Arab States themselves, the League of Arab States and the organizations affiliated with it, such as ALECSO and the Industrial Centre for Development, and also through international organizations related to the field of information such as UNESCO, WHO, FAO, UNIDO, etc.

This Arab centre's rôle will be to acquaint itself as to the sources and centres of information in the developed countries and the Arab States, then to diffuse and publish new information by various ways and means and to train personnel in the field of information.

At the present stage it is better to establish one centre for the Arab States and to pool all human and material resources necessary for it, whether these resources are from the Arab States or from the developed countries. In this centre information is centralized, then fed to the Arab States through their national centres, then, when human and material resources are available to those countries, an information centre could be established that in turn gives and takes from the regional centre.

This means that we are calling for the establishment of a big Arab regional centre for scientific, cultural and educational information that would supply the Arab States with all the new information in these three fields. This centre, in turn, should have all its needs, whether equipment or finance, supplied. Moreover apart from providing the Arab States with information, the centre would also undertake the task of training personnel in the national centres.

A plan of action should also be considered within the coming ten years to establish an information centre in each Arab State that can be fed with data gathered by the main regional centre and in its turn feed back information available in its country. This task is facilitated by the common language which is used in this large part of the world.

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AN INFORMATION SCIENCE OPTION IN A COMPUTING SCIENCE CURRICULUM

by

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Information workers in Canada have been educated in library schools, in departments of computing science, or through a combination of industrial and self training. A description is given of an option in information science offered within a department of computing science. Special emphasis is placed on a laboratory which features a machine readable catalogue and on-line terminal access to bibliographical records.

Over the past ten years, in most advanced industrial countries, coherent discussion on the training of information workers has been hampered by the lack of an accepted definition of the worker and his field. Is the information worker a librarian, an engineer-information officer, a computing scientist, a subject specialist? Is he or she concerned with conventional libraries, computerized information centres, or special files such as digitized meteorological data? The debate on the functions and characteristics of the worker has necessarily been matched by debate on the place, purpose, and definition of his training, see: ref. 1-7.

Canada has not escaped this self-examination; and journal publications, government task forces, society study reports, and conference proceedings attest to this scrutiny. To give examples, G. Piternick and A. Brearley discuss the training of scientific information workers[4]. The « Tyas » Report[8], the results of the work of a government study group on scientific and technical information, includes the recommendations of a sub-group specifically concerned with education and has an appendix on the information scientist's education with an extensive bibliography[2]. An updated summary of this appendix will appear in *Information Science in Canada*[9]. The Annual Meeting of the Canadian Library Association in Hamilton, Ontario, 1970, discussed the interaction of government recommendations and information workers' education. A recent study by S.R. Reed surveys library education in Canada[10]. Papers by D.M. Heaps presented at FID and ASIS meetings discuss user training and the interaction of national policy and education[11 12]. A survey of these documents indicates little agreement either on the functions or the purpose of education for information workers in Canada, but we believe, nevertheless, that distinct Canadian trends can be discerned and that these differ from those evident elsewhere.

We assume that the information worker must now have, in addition to knowledge of certain traditional library techniques, some familiarity with computer methods. It is not significant whether the computer is used for library circulation control, preparation of KWIC indexes, or data base searching through profile preparation. Granted such needs, in Canada training for this worker has been available from three major sources. The first has been the library schools, of which there are presently eight. Sub-professionals, excluded from consideration in this paper, have recently been trained in « community colleges »[13]. All of these library schools give library courses which include instruction in computer methods, which may be as simple as having students learn to operate a keypunch or as complex as a joint thesis project on semantic clustering of index terms with a department of computing science[14].

Until very recently the second most important source of information workers in Canada has been the school of self-training, usually in conjunction with an industrial firm or government research establishment, see ref: 15-17.

The third source, departments of computing science in Canadian universities, has been developing rapidly over the past three to five years. The type of training offered is almost as varied as that found in Canadian library schools. Emphasis might be on any of the following: file structures for business management type data bases, hospital information systems, law and privacy considerations, theoretical investigation of tree-like information structures. On the whole, courses available have tended to be oriented more to computing science and relatively little attention has been paid to the classical library-type problems such as are posed by circulation, indexing and classification. The text used has often been Gerard Salton's *Automatic Information Organization and Retrieval*[18] and emphasis has been placed on areas such as statistical procedures for automated indexing. In both library schools and computing science departments, almost all courses are currently undergoing reassessment[19]. Figure 1 is an attempt to represent the situation in both library schools and computing science departments as currently judged from university calendars.

The remainder of this paper will be concerned with the education of information workers offered as an option within the Department of Computing Science, University of Alberta, with emphasis on a retrieval laboratory. In this department, since 1967, a detailed plan has been followed in developing an option that would combine the necessary techniques from traditional library and information centre training with those from computing science and related disciplines. The graduates from the programme are thus useful immediately and employable either in specialized information centres doing current aware-

Figure 1 - INFORMATION SCIENCE IN CANADIAN CURRICULA (to June 1971)

CORE SUBJECTS		AlLS	DaLS	McGLS	MoLS	OtLS	ToLS	UBCLS	WOLS	AlCS	GuCS	LavCS	LoCS	MaCS	MoCS	QuCS	SRCS	SSCS	ToCS	UBCCS	WOCS	YoCS
Related mathematics								/	×	×	×	×	×	×	×	×			×	×	×	×
Linguistics & concept formation					×	×	×	×	×	×	/			/	×	×		/	/			
Special Fields	humanities	×	×	×	×	×	×	×	×	/											/	
	social sci.	×	×	×	×	×	×	×	×	/			/	/							/	
	sci./tech.	×	×	×	×	/	/		×	×			×	/							/	
Modern research in information theories						/	/	/	×	×	/	×		×	/	×		/	×	×	×	/
Computer hardware				/	/	/	/	/	×	×	×	/	/	×	×	×	/	×	×	×	×	/
Computer software				×	/	×	×	×	×	×	×	/	/	×	×	×	/	×	×	×	×	/
Manual methods		×	×	×	×	/	×	×	×	×						/		/	/			
Management organization			/	×	×	×	×	×	×	/			/	×				/	×		×	×
Classification of knowledge		×	×	×	×	/	/	/	×	×	/	/		/	/	/		×		/		
Management skill		×	/	×	×	/	/	/	×	/				/				/	×		/	/
Practical experience		/		/	/	×	×	×	×	×	/		/	/					/		/	/
Leisure knowledge																						
Communication skills				×	×	×	/	×	×	×								/	/	×	/	/
Research knowledge & skills applied to inf. sci.		/	/	×	/	/	/	/	×	×	/	/		/	×	×						
Systems & operations research			×	/	/		/	/	×	×	/	×	/	×	/	×		×	×	×	×	×
Social structure & the environment		/			×	×	/	/	/	/			×						/		×	

× = adequate. / = needs expansion. AlLS = Alberta, School of Library Science. DaLS = Dalhousie, School of Library Service. Mc GLS = McGill, Graduate School of Library Sci. MoLS = Montreal, Library School. OtLS = Ottawa, Library School. ToLS = Toronto, School of Library Science. UBCLS = British Columbia, School of Librarianship. WOLS = Western Ontario, Grad. School of Library & Information Science. AlCS = Alberta, Dept. of Computing Science. GuCS = Guelph, Dept, of Mathematics & Statistics. LavCS = Laval, Programme d'Informatique. LoCS = Loyola, Dept. of Computer Science. MaCS = Manitoba, Dept. of Computer Science. MoCS = Montreal, Dept. d'Informatique, QuCS = Queens, Dept of Computer Science. SRCS = Sasatchewan, Regiana, Dept. of Compute Science. SSCS = Saskatchewan, Sask atoon, Dept. of Computational Science. ToCS = Toronto, Dept. of Computer Science. UBCCS = Brtish Columbia, Dept. of Computer Sci. WOCS = Western Ontario, Dept. of Computer Sci. YOCS = York, Dept. of Math & Computer Science.

ness or retrospective data base searching or in conventional libraries that have circulation or similar problems of a magnitude that requires computer assistance. Students undertake advanced research in specific areas of information science, see ref: 20-29.

The development of this organized plan was possible because the University of Alberta had available an IBM 360/67 computer, (at the time an advanced time sharing computer *). The Department of Computing Science also at about that time offered degrees at the Bachelor, Master, and Doctorate level in conventional areas in computing science, such as programming languages, numerical analysis, and so forth. In 1971 the Department had a staff of twenty. In other words, the foundation had been laid on which to build an option in information storage and retrieval.

It was realized that courses developed for the option would remain too theoretical unless laboratory facilities were provided that duplicated employment situations the student could expect to meet. The Computing Science section of the University Library collection was loaned to the Department on a long-term basis to form the core of a small information centre which embraces a monograph, journal, report, and manufacturer's manual collection. This now numbers 1650 monographs, 140 journal subscriptions, 500 reports, and 350 manuals. An on-line terminal was installed and an information specialist with computing science training employed. Initially both manual and computer batch procedures are being carried out, but the laboratory is planned and the courses designed for eventual on-line control of library operations with off-line batch used where suitable. It has been clearly understood from the beginning that knowledge of and improvement in computer operating systems, priority queues, and so forth would need to advance markedly before widespread fully automated on-line library or information systems are economically feasible or operationally possible. It was postulated, however, that the more students were exposed both to the problems connected with conventional manual handling of information and advanced on-line handling the better prepared they would be to deal with the problems that arise in moving from manual to automated systems or in combining both. Canada, as one of the most highly urbanized countries in the world, has a mixture of urban concentrations separated by sparsely populated spaces. Thus a Canadian information worker may be employed equally in a small centre with no advanced aids save the possibility of a hookup to a large remote computer, or in a centre with sophisticated equipment and highly skilled backup staff, such as that provided by a large industrial corporation.

From 1967 to 1971 both the laboratory and the courses have developed. The enrolment in this option has risen from six to sixty-two, of these

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* Acknowledgement must be made here to the continuous support given to the programme by the Department Head, Dr. D.B. Scott.

twelve are graduate students, ten masters and two doctoral. There seems to be a demand for students with such training; already students are finding employment in very responsible positions.

The key courses are CMPUT 560 — Information Storage and Retrieval, CMPUT 670 — Coding and Storage in Information Retrieval, and CMPUT 671 — Classification Problems in Information Retrieval. All students will have the normal Computing Science general background in programming languages, numerical analysis, statistics, and digital design. They are encouraged to take complementary courses in linguistics, Canadian social and political structure, and adaptive systems.

During the past year fifty students used the laboratory for conventional literature searching of indexes and abstracts, performed assignments in indexing and classification, used a manual co-ordinate index, wrote KWIC programs, and developed searching programs using boolean and weighted search logic for a computing science literature collection, the data base of which they had helped prepare using the journals available in the laboratory. Machine readable data bases, such as the one in acoustics literature[30], are also available for testing both for automated indexing and automated classification. The graduate students also use the laboratory for research in fields involving the development of a total integrated information system.

The monograph records in the laboratory are maintained in machine readable form. These are available for on-line catalogue searching and on-line circulation control. A doctoral student is concerned with the development of efficient file structures for the on-line control of a total library system; acquisitions, catalogue, and circulation. All students taking the storage and retrieval option have sessions at the terminal, which demonstrate current capabilities. They are able to investigate query languages and to understand what information is necessary for accessibility and storage in an on-line situation. Off-line tools such as KWIC indexes to the monograph collection, author catalogues, shelf list catalogues and journal holding listings are available and used in the control of the laboratory. The monograph and periodical collection is purchased from the Department's Library Fund allocated by the central University Library which also controls the cataloguing. The Department, therefore, accepts the basic bibliographic descriptions and classification from the central Library, but at the same time is investigating classification aided by an on-line thesaurus.

The Computing Science Department Information Retrieval Group searches Chemical Titles in co-operation with the Alberta Information Retrieval Association and has developed efficient current awareness and retrospective search programs for large data bases. These are also demonstrated to students through the laboratory. Search, statistical analysis and re-formatting and printing programs have also been developed for the MARC tapes and students either use these to search the tapes, to develop modifications to the tapes, or to organize MARC tape searches for representative faculty members. This gives the students an opportunity to experience the difficulties of question formulation in both scientific and non-scientific fields and to write suitable user guides. The information specialist in charge of the laboratory assists in the preparation of these guides and in formulating and running various profiles. Students are also given terminal sessions in the operation of an on-line thesaurus, which was developed initially for teaching and illustration purposes and which, now linked to a classification scheme, is to be used with a fully integrated special purpose information system designed as part of a research project. The integrated system is to be operational in a governmental/industrial environment. Such sessions enable the students to appreciate the value of an online thesaurus as a scientist's or information worker's training. The Department feels that the student who intends to make the provision of information his career must be fully aware of the difficulties of the identification of information content and therefore must know about and be capable of indexing and classification, both manual and automated. He or she must also realize the price to be paid and the organization necessary for the efficient use of the computer in information handling and understand how costs and organization compare with manual methods. To this end, students must write and run programs and see the results operative in a day to day situation in an information centre laboratory which is used as an aid to classification, indexing, and in general control of a system.

The laboratory is open for general use to all computing science students and is able to provide services to other areas on campus. Library School students have the opportunity of seeing a « live » on-line demonstration of the automated catalogue and circulation system and the Computing Science literature search serves those who are interested in computing applications in their own disciplines, such as law or education, but who find that the computing journals are not referenced in their normal sources of information.

The laboratory is regarded as an integral part of the information scientist's or information worker's training. The Department feels that the student who intends to make the provision of information his career must be fully aware of the difficulties of the identification of information content and therefore must know about and be capable of indexing and classification, both manual and automated. He or she must also realize the price to be paid and the organization necessary for the efficient use of the computer in information handling and understand how costs and organization compare with manual methods. To this end, students must write and run programs and see the results operative in a day to day situation in an information centre laboratory which is used by undergraduates, graduates, working scientists and teachers, and members of the industrial community.

In addition to acquainting the student with the practical problems of implementing automated procedures, the laboratory environment ensures close co-operation between librarian and computing scientist. In this situation the computing scientist interacts with the user also and has the opportunity to learn first-hand of user reaction to automation and what the user expects of the information centre. The information worker is not trained in a vacuum, but in an environment which reflects the difficulties, both technical and human, that will be encountered in the working world.

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SEMINARS FOR THE SEVENTIES: A CO-OPERATIVE PROGRAMME FOR CONTINUING EDUCATION IN THE UNITED STATES

by
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A description is given of the criteria and curricula for two seminars designed by the US Federation of Science Abstracting and Indexing in order to provide practical continuing education for information workers and focus on products and services other than the conventional printed book form. To keep pace with rapid information technique developments, emphasis is placed on the cooperation of the staffs of member services and information science faculty. The three-day indexing seminar, *aimed at developing a sense of perspective, provides an introduction for beginners and assistance to experienced indexers in evaluating developments (in special sessions at appropriate levels). A daily lead-topic lecture is followed by discussion of actual case histories.* The two-day computer-based seminar *aims at providing an understanding of essential criteria in making analytical evaluations of machine readable services. It covers an introduction to these services and machine systems technology, overview of available services, impact on the organization, cost considerations and utilization of services. At this last, most important, session case histories are given by invited speakers.*

The U.S. Federation of Science Abstracting and Indexing Services recognized, to quote the Conference brochure, that « the rapid development of information techniques has provoked a growing demand for specialists for general and particular tasks that require adequate training ». In developing an education programme that is responsive to the needs of the 1970's, the assistance and advice of member service staffs and information science faculty were sought. A Seminar programme has been developed in two areas — indexing and the use of computer based bibliographic services.

In addition to the co-operation of Federation member staffs (the producers of bibliographic services) and information science faculty in Seminar design and syllabus development, lecturers at the Seminars are invited from member services and faculty to provide a blend of producer expertise and education experience. Although the Seminars have been developed as continuing education programmes for people already working in the information science field, several universities have invited the Federation to hold the Seminars at locations on

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campus. This has meant that faculty members and some students can attend each Seminar. This has a stimulating impact on the individual Seminar and has also assisted faculty subsequently in developing undergraduate courses.

Background: When the U.S. Federation of Science Abstracting and Indexing Services was incorporated in 1958, the aims as stated in the Articles of Incorporation were: « to foster, encourage, improve and implement the documentation (abstracting, indexing and analysing) of the scientific and technological literature of the world, by means which shall include... education, research and publication of lists of scientific and technical periodicals... ». In developing an education programme over the past few years the following objectives have been developed; first the need to provide a programme of continuing education for people engaged in information work which is of practical value and, second, to focus on products, and services being offered in other than the conventional printed book form. As a result, two Seminars have been developed. The first Seminar is on indexing and has been designed specifically to develop a sense of *perspective*. The second Seminar deals with the use and evaluation of computer based services by librarians and information specialists.

Indexing in Perspective Seminar: In designing this Seminar, the Federation was fortunate in having the guidance of Everett H. Brenner (American Petroleum Institute and lecturer at Pratt Institute Graduate School of Library Science and City University of New York). He developed the syllabus for the Seminar and serves as principal lecturer. By developing a sense of historical perspective, the three-day Seminar provides an introduction to indexing for beginners and assists experienced indexers in evaluating current developments. A *perspective* lecture on vocabularies, index systems and retrieval respectively is given as the lead topic on each day of the Seminar. This lecture is followed by a case history based on actual operating experience. For example, the *perspective* lecture on vocabularies covers the relationship between classification and indexing; the differences and similarities that exist between classification decimal entries, subject headings, terms, descriptors, etc. The characteristics of a classification scheme, subject heading list and a thesaurus are discussed, together with the effect of the computer on indexing vocabulary and the relative merits of controlled versus uncontrolled indexing. This lecture, which is given by Mr. Brenner, has been followed at different Seminars by a case history on *Engineering Index* vocabulary development; the use of the UDC as an index language; and descriptions of the index system developed by the American Geological Institute and the American Dental Association.

The second day deals with index systems and the third day with retrieval and follows the same format. The *perspective* lecture on retrieval is given by Prof. F. W. Lancaster (University of Illinois) and the case history is drawn from an information processing centre that offers services from several machine readable data bases. During 1971 the topic of on-line retrieval has become increasingly important in this session and in 1972 it is expected that the discussion of this aspect of retrieval will be emphasized even more.

As the Seminar was designed for both the beginning indexer and the experienced, it was necessary to provide special sessions at the appropriate level. Special workshop sessions are organized on the first two days. The workshop for beginners allows for a discussion of the vocabulary used in indexing and a basic session on how to develop and evaluate an index. The advanced workshop allows for an in-depth discussion of the case histories presented.

Through discussion in the beginner workshop it was quickly discovered that one of the main problems for new indexers is the vocabulary of information science. The Federation therefore prepared a draft glossary of terms used in indexing for the Seminar. This is revised as a result of experience at each Seminar with a view to eventual publication. A special bibliography is also prepared for the course.

During 1971 the Seminar is sponsored by the American Library Association, Resources and Technical Services Division, Cataloguing and Classification Section, Subject Analysis and Organization of Library Materials Committee. The Seminar has been held in Philadelphia, New York and Chicago to date. In New York it was hosted by the Graduate School of Library and Information Science, Pratt Institute.

Computer Based Services Seminar: In developing the Seminar which has the stated purpose of providing registrants with an understanding of the criteria to be considered in making analytical evaluations of machine readable services, a different approach was needed. This Seminar is intended for people who have to make value judgements on acquiring machine readable services for their organizations. The Federation is particularly indebted to Dr. Tefko Saracevic (Case Western Reserve University) who assisted in the design of the syllabus and prepared the following statement for the Seminar brochure:

> « Many individual information retrieval systems and libraries are faced with the problem of the increasing cost of covering the literature of interest to their users. As the literature proliferates, many organizations feel the lack of professionals to cope with its organization for use (especially in machine readable form). One partial solution is to utilize available services which provide already processed machine readable input covering some subject literature for subsequent individual utilization. However, the problems of selection, utilization, and especially integration of these services into individual systems and libraries are not simple or easily resolved ».

The topics covered in the two-day Seminar are an introduction to machine readable services and the technology of machine systems; survey of available services; cost considerations; impact on parent organization and the utilization of services. A series of special check-lists have been designed for this Seminar to cover the scope of available services, impact on the organization, cost considerations and the utilization of services. The check-list for utilization, for example, allows participants to take notes on it while listening to a series of case histories as all the check-lists contain such items as data base content, searchable data elements, profile and search methods, etc. Using the check-lists, it has been found that the sessions on costs and impact on organization are better run as discussion sessions rather than straight lectures. The lists provide the discussion framework and the discussion leader can encourage a sharing of experience among the other speakers and the registrants.

The most important part of the Seminar is the session on utilization which consists of case histories given by invited speakers specially selected for their knowledge and practical utilization of machine readable services. This session takes almost half of the total time for the Seminar. The philosophy underlying this session is that users will have different requirements depending on environment. For example, a library hoping to use the MARC (Machine Readable Cataloguing) tapes produced by the Library of Congress will have different use requirements from an organization with an existing internal mechanized system of information handing, while an organization with no mechanized processing facility will face yet another set of decision points. The case histories therefore range over the use of MARC tapes; an organization with an internal mechanized system; the experience of a producer of a tape service that also provides a specialized SDI service; and an information processing centre that provides services from multiple tape data bases.

As for the Indexing in Perspective Seminar, a special bibliography has been developed for this Seminar. In addition to the check-lists already mentioned, the Seminar kit also contains the specifications of all mechanized data bases produced by Federation member Services. However, there is no attempt to turn the Seminar into a sales promotion campaign on behalf of member services or products.

The Seminar has been held at Case Western Reserve University in Cleveland; City University of New York; and Illinois Institute of Technology Research Institute in Chicago. It is to be held under the sponsorship of the American Society of Information Science Student Chapter of Pratt Institute Graduate School of Library and Information Science in New York in December 1971.

Conclusion: In developing a Seminar programme which would provide for the continuing education of people engaged in information science work, the Federation has chosen to focus on the topics of indexing and the evaluation and use of computer based services. The success of the Seminars has been demonstrated by the positive assessment obtained from evaluation forms which are completed by the registrants at the end of each Seminar.

The co-operation of the staffs of member services of the Federation and information science faculty is the most valuable aspect of the Federation programme. It has not been possible in this paper to mention by name all the people who have contributed time and effort to make the Seminars a success. The combination of producer expertise and experience as educators in information science has provided a blend of talent that forms the basis of the education programme. This combination has allowed the Seminar programme to keep up with the « rapid development of information techniques » and to answer, at least in the topic areas covered by the Seminar, a response in terms of the 1970's to the « growing demand for specialists for general and particular tasks that require adequate training ».

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THOUGHTS AND SUGGESTIONS ON THE TRAINING OF DOCUMENTALISTS

by
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In light of the needs of the developing countries the intrinsic qualities and technical skills required by the documentalist, in particular in industry, are listed, and the need to recognize his key position stressed. A programme is described based on aptitude tests and basic training followed by training in options (economics, management, industry etc). The specialist needs in documentalists in Tunisia are surveyed. On the organization of documentation at national level, emphasis is given to the need to create a network of communications among existing centres, to bring existing or new centres into contact with an outside documentation network, to study the rational installation of documentation centres at national level and to provide updating sessions for already trained specialists.

My purpose here is to raise certain questions which I have encountered as a user, and put forward some suggestions and some hopes which I submit to your attention.

At the National Productivity Council, the setting up and organization of a documentation service were undertaken from when I first took over leadership of this body. This tells you how much I was and still am aware of the capital importance of such a mission in business: I consider, in a word, that it stands surety to any effective decision and I believe in consequence that documentation, far from being relegated to the rank of filing systems, should be the foundation stone of all rational, scientific activity.

The house documentalist should therefore be a really full-fledged member and should also be worthy of it.

It is with a view to meriting this place that I would today like to make a few remarks and suggestions, which stem from our experience of the setting up and organization of the service which I have mentioned. All these remarks are linked to the subject of the conference: through them and in the debates they may provoke, there is the contribution of a user directly and emotionally engaged. This is what I wish to submit to you today, and I trust it will prove to be a contribution, however modest, towards enriching the already precious basis we possess on the subject of the training of documentalists.

The first point of major importance, in my view, and which should therefore receive the training authorities' full attention is the need to:

— Develop the function of documentalist

— by the quality of the officers trained:

The documentalist should be of the requisite standard and possess adequate background training.

The psychological aspect of his general profile is of major importance.

He should possess a dynamic curiosity. Therefore in candidate selection an appropriate psychology test should be applied.

He must have a « sense of contact » and be « human ». It is impossible to stress this point too much. Many qualified documentalists are lamentably lacking in this aspect of communicability (the inclusion of some psychology in the curricula is necessary).

It must not be forgotten that the documentalist is in permanent contact with users in the business and outside.

Moreover, he has to play the rôle of guide and stimulator in documentation. His mastery of conversation and communication must thus be solid (a good documentalist must be able to sell his product and evoke needs).

— Patience and constant perseverance

— Lastly, a striving for perfectibility and a feeling for research.

— Informing economic sector executives on the question of documentation:

— Well-chosen information avoids overlapping of jobs, leads to time saving and enables benefit to be reaped from efforts provided elsewhere (opening onto the experience of others with adaptation effort).

In fact, this informative aspect takes place through the quality of trained documentalists.

I have touched very briefly on the intrinsic qualities which condition the documentalist's success in his job. I think that this part of his human training has so far been neglected (and this in many other disciplines, too). But I would again stress the aspects of selection of suitable candidates for the task in question and the development of these aptitudes by means of a training in the fields mentioned.

As for the properly technical qualities, I will only touch on a few aspects:

— Specialization and documentation:

This is an eminently important facet of the question. I believe less and less in any standardized training of documentalists.

In my view there is a level of acceptance of candidates:

- In addition to a selection process based on the candidate's human potential,
- A selection taking into account the anticipated specialization.

That is to say, one should take (according to the requirements studied in advance of the market) a certain number of candidates who should be given a period of common training (basic training — documentary techniques, etc.).

But after a certain time (to be decided) there would be options to be included in the curricula (Economics, Management, Industry, etc.).

Training would differ according to the destination of the documentalist to be trained.

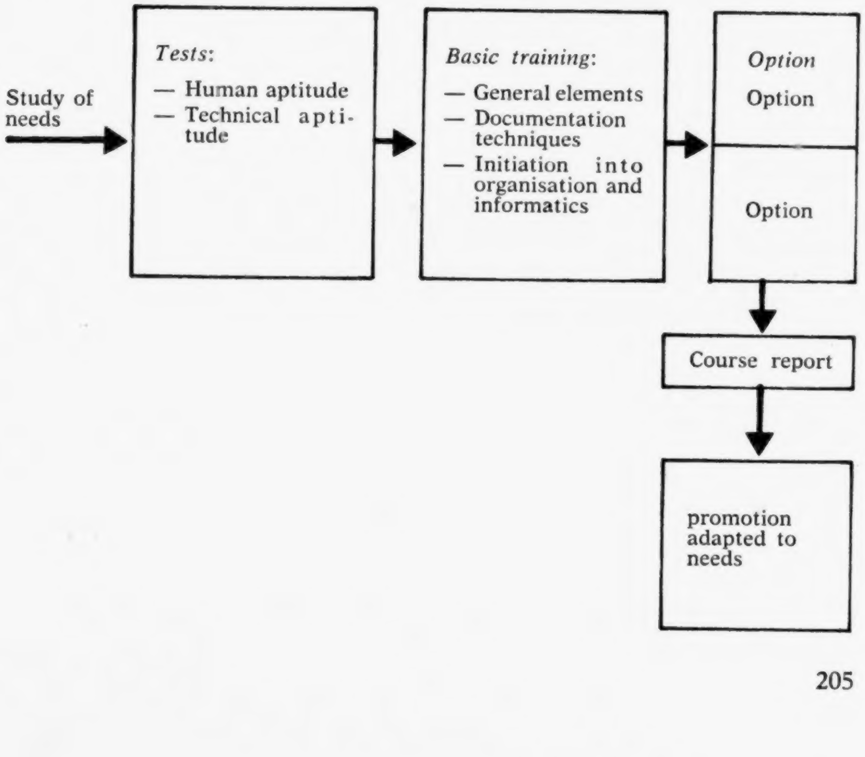
This would permit the future documentalists to become already familiarized with the jobs they will have to fill and to tackle their work with a training permitting their rapid, effective integration.

— An on-the-job course, duly chosen, with a course report, are recommendable as a test contributing toward the final examination.

— For the curricula, I would suggest the initiation of future documentalists on two essential points which they will certainly come up against in their jobs, whatever the business they work in.

— General principles of work organization.

— The setting up and organization of a documentation cell.


Study of needs
Tests:
— Human aptitude
— Technical aptitude
Basic training:
— General elements
— Documentation techniques
— Initiation into organisation and informatics
Option
Option
Option
Course report
promotion adapted to needs

This opening into spheres beyond documentation proper will undoubtedly help to strengthen the rôle of conception and reflection in documentalists who tend (without generalizing) to become bogged down in a rôle as operators pure and simple and ordinary intermediaries.

— An initiation into the problems of mechanization and the possibilities of automatic data processing.

On the subject of specialization, I estimate that Tunisia is in great need of a category of higher documentalists, viz. specialists (engineers, economists, etc.) to be given a supplementary training as documentalists. They would be the future managers of the Study and Research services in businesses and would be over the career documentalists. Only they would be capable of really feeling and satisfying the requirements of a specialized clientele.

Librarians	Execution
Prof. Documentalists	Intermediate Executives (Operation)
Higher Documentalists	Specialists + Training (Conception)

I will now leave these few thoughts-cum-suggestions regarding the function of documentalists and go on to the overall questions of the organization of documentation at a national level.

— The need to create organic links: a nework of communications among existing centres, perhaps leading to a real national-level information bank. Documentation centres are good on condition they limit overlapping, bottlenecks of information flow and finally cost.

— Bringing existing or envisaged centres into contact with an outside documentation network: for the permanent inflow of useful information. At present each one gets on as best it can by itself, often badly, using its *savoir faire* and enthusiasm.

— Studying the rational installation of documentation centres at a national scale.

— Finally, it is to be hoped that recycling sessions be conceived for executives who have already been trained. The essence of these sessions would be constituted by the actual cases experienced by the participants.

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TRAINING THE BUSINESS INFORMATION SPECIALIST

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Effective business information specialists must be thoroughly trained and experienced in both business management and information science. They must be capable of improving the business executive's decision-making process. Above all, the business information specialist must be strong enough to maintain a high standard of professional performance and integrity.

Computerized business applications have caused a data explosion that provides excellent career opportunities for business information specialists who are trained to build information transfer networks. These careers must attract business executives with several years of experience in line and not staff management.

The early training of the business information specialist includes a confrontation with the electronic data processing environment.

Computers are utilized in business to help maintain control of the company operations by filing data and printing pages of data listings. Data listings are then sent to people who cannot or will not convert the data to information for many reasons explained later.

Executives objecting to receiving data listings and requesting information instead are referred by the data processor to another person who will have an electronic processing job title that misrepresents this person as a designer of information transfer networks.

This expert data processor will try to help the business executive, but is in love with the computer environment, not the executives' environment, and will fail.

Business executives believe electronic data processing specialists have over promised and under performed.

1. Before computerization it was sufficient for company operations to send out one or two business reports each year. There must be magic in the lunar cycle, for after computerization, more complex reports are printed monthly and sent to more people.
2. Stacks of computerized reports are received by the executive who does not read them and dead storage of these reports has revived

the microform industry. A generation of executives will be coming in the next decade who will be even less disciplined readers of reports. They have been influenced by home television and oriented to receive graphic and oral communication.

3. Older computerized reports are not eliminated easily. New reports are instituted without evaluating the data content of old reports.

   The executive receiving both reports is faced with detail that frequently overlaps.

The information specialist must be trained to create information from data and establish an information network capable of transferring information that will improve the decisions of executives.

Specialists must be taught the difference between data and information and that information is not a substitute for executive knowledge or wisdom.

1. Information is data that has been massaged by human logic and emotion and is in a form that allows for analysis and comparison by gross and finite factors of magnitude and cause stated in the user's language.
2. Knowledge is information that is understood by the user.
3. Wisdom is the accumulation of knowledgeable concepts that are associated and compared and culminate in a new idea.

   A business executive's wisdom is evidenced by moments of brilliant insight into the most complex business problems and exceptional good judgment in making short and long range decisions.

The information specialist must understand the attributes of information:

1. Quantity
2. Content
3. Format
4. Language
5. Completeness
6. Accuracy
7. Relevance
8. Timeliness
9. Useful Life
10. Flow
11. Collection Cost
12. Processing Cost
13. Distribution Cost
14. User Benefits.

After the information specialist has learned these attributes and worked out the specifications with the users, an information transfer network can be implemented. Before the business information specialist-trainee there must be a time of trial and error spent in the business environment. The rules and comments that follow can make that time spent more productive.

Guidelines for business information specialists.

Rule one: *The information specialist must get involved in the user's daily operation to know what are the existing and future information needs of the user.*

The business information user must accept some responsibility to insure the proper training of the information specialist. One way to do this training is a temporary period of employment in the user's operation. The specialist trainee then could; 1. Interview the employees, 2. Keep a daily diary, 3. Collect documents and reports, and 4. Prepare an information transfer flow chart.

Rule two: *Learn to speak, write, and make illustrations suited to every user's level of understanding and in the language of the user.*

Information specialists that do not understand the user's language cannot be successful. Specialists that will not or cannot comply should seek other employment.

The user's do not need to know the information specialist's language to do their work, but the specialist must. Misunderstandings between the information specialist and the business user in specifying the requirements of an information network are a common cause of disaster.

Rule three: *Be prepared to face conflicts arising in the transfer of information because it threatens the status, pride, and security of executives.*

When data is turned into information by the specialist it is difficult to discredit and may show that an executive's prior decisions were wrong, that a superior's decision was wrong, or that the executives were both wrong. This same information may lead to painful interviews with other executives. It is no surprise there are so few information specialists that are strong enough to survive in the commercial environment.

Rule four: *Define what the user's superiors expect to achieve through the implementation of an information transfer network.*

If the workers can see the executive using the information it will speed the implementation. The best efforts of the specialist are wasted if the workers' superiors do not reward the workers for using the results of the network. Executives and workers must be sincerely reassured that a good information network is not a substitute for their knowledge or wisdom.

Rule five: *Determine what level and frequency of information is desired and needed by the users and meet the demand.*

Only the line executive knows the capability of the worker to absorb and act on information. Don't deliver an elephant when a mouse would do. Above all, don't provide data disguised as information and expect the executive's workers to turn it into information.

Rule six: *Design into the information transfer an intermediary data handling that allows for a further sorting and reduction of data.*

This will provide the users with a tool that allows them to classify and sort the data stored in the computerized file cabinet.

Rule seven: *Insist that the executives and the workers voice their need for specific information and incorporate these desires as highlights of information reports.*

To say the users do not know what their requirements are or will be is no more valid than saying the information specialist does. Always have report formats prepared in advance of discussion of this nature and use them to get the executive and the worker to communicate their needs. There is much merit, beyond getting report formats approved, in getting the users involved.

Rule eight: *The users will have complete control of the information transfer after implementation.*

The form, dimensions, and frequency of each information report must have been tailored to each user.

Rule nine: *A report that does not identify trends and highlight cause and responsibility is not an information report.*

The basic element of a good information report is to communicate to executives a timely and accurate identification of trend change.

Rule ten: *Carefully examine all existing reports and work toward their replacement, consolidation, or elimination as user-oriented information reports are available.*

Monthly computerized listings that are widely distributed to people who seldom read them, two or more reports that contain much the same information, and conflicting reports from different functions need attention.

Rule eleven: *Be prepared for criticism when the costs of data collection, processing, and information transfer are compared to the executive user's performance.*

The successful company expects a return on its assets. An information transfer network can offer to executives and workers, who also cost money, the tools that can increase ability to assess risk, reinforce the decision-making process, better understand all company functions, and increase control over their operations. These are all abstractions and do not merit a line on the profit and loss statement; and, if the information network is successful, it will seldom receive praise for its contribution. Short range performance may even worsen, if executives react negatively to the information reports which can be incriminating. Long range performance should improve considerably, if executives are in a position that encourages them to act positively on information and make wise decisions for the future.

Information specialists in the business environment must be trained to understand management science and information science. They must be capable in assisting executives and workers to improve the human decision-making process. The successful business information specialist must adapt to the commercial environment, be a good seller of the benefits of the information transfer, be part of the management team, and be strong enough to maintain professional integrity above all other considerations.

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AN EDUCATIONAL SYSTEM FOR THE INFORMATION SCIENCES

by
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The subject information science is defined as the designing and installation of information systems, and the role and the demand for different kinds information scientists in the Federal Republic of Germany is described. The foci around which the education in the information sciences should be organized are given: theories and methods of information sciences; information processes; presentation and transformation of data (I): Theory of symbol structures; presentation and transformation of data (II): operations on and transformation of symbol structures; technology of information systems; law and politics of information; organization and management of information systems. Course structure for undergraduate and graduate level for information sciences as a major and as a minor subject as well as study plans are proposed.

1. *Subject Information Sciences*

In the United States the « information sciences » have become an established academic field with extensive programmes for research, development and training. In other countries, like the Federal Republic of Germany, the information sciences are as yet barely existent — with the exception of the programmes offered in the field of documentation. As a consequence there is a critical shortage of programmes and experts who are able to handle the wide variety of problems and to design, implement and operate the numerous kinds of information systems. In the Federal Republic the Federal assistance programme for the « *informatik* » field (or « *informatique* » in France) as an academic subject and field of research can only satisfy a small portion of this demand because of its explicit orientation towards the theory and technology of electronic data processing. The German term « *Informatik* » corresponds to the English term « computer sciences » and not to « information sciences ».

But the computer alone, is not, however, the reason for that new class of problems. Above all the increasing complications in planning and decision processes, the intensification and extension of communication, the impact of communication media and the rôle of information in all kinds of innovation have led to the realization that information has become a precious good that has to be administered with care and whose organization and handling is worth a sizable portion of the scientific, technical and economic potential.

In order to obtain indications about the self-image of the future information scientist one should look at the structure of the knowledge and logic of the procedure he needs to cope with his problems.

Information scientists are providing the information environment for problem solvers. Their central methodological difficulty is to understand the logic of the problem solvers' problems and the structure of the knowledge they need. Professionally, they try to « break their heads » on behalf of other people, not only in the context of a particular problem, but a whole class of future problems. Their dilemma is to know what somebody knows or might need to know. In contrast to the traditional scientist who can consider himself outside and different from his object, the information scientist — even in theory — is in a very symmetric relationship with his subjects. He relies on good information exchange with those for whom he designs his system.

The subject of information sciences is the design and installation of information systems of any kind — whether they require computers or not — scientific and technical systems (STI) which so far have been given the larger amount of attention are only one among the numerous types of information systems.

« Management-Information Systems » have become widely used; other types are being discussed and developed as « Planning Information Systems », « Citizen Information Systems », « Legislation Information Systems », « Political Information Systems », to name a few which hardly resemble scientific or technical documentation centres. Not only in the United States was emphasis concentrated on scientific and technical information systems, mainly due to the Weinberg Report in which STI was depicted as a major bottleneck of national well-being. It has, however, become obvious, that the gamut of information processes — and not only STI — are in a critical state, and that the non-STI-processes pose even more wicked problems.

Renaming ADI into ASIS was a symbolic indication of the widening scope of the field. It was farsighted and courageous to claim the whole area of information processes and systems. But the present state of the field reveals that it has not yet grown into its new clothes.

Various kinds of information scientists are needed. Some forms of professional activities in demand are:

— planners and designers of information systems for government, administration and industry;

— managers of information systems that are already in operation;

there are many indications that the position of « information directors » is emerging as a regular part of company boards;

- information scientists and methodologists who deal with R & D in the information sciences (for instance within universities, colleges, non-university institutes and industrial laboratories);
- experts for information planning in the public administration;
- operators of scientific and technical information systems; scientific documentalists and librarians fall into this category together with experts in traditional disciplines who concentrate on the information problems of their particular field;
- professionals acting as « information brokers »: information scouts for topics, information sources and channels; they market available knowledge, e.g. by stimulating knowledge transfer into new fields of application including the implementation of an appropriate mode of display (as in the NASA Tech Brief Programme);
- « information industrialists » who — as entrepreneurs and managers — cover the commercial information-market, for instance by offering « information-service systems » or «information utilities»;
- « information lawyers » who represent the citizen in the controversies over his information rights and obligations and who participate in legislation concerning the law of information.

The variety of professional images shows that it would not be justified to conceptualize and implement the information sciences as a single discipline. It is, on the contrary, rather an area that must allow many foci to develop and to be blended in order to meet the variety of requirements. A rigid and strictly separated course structure should be avoided, since a vivid development of the demanded types of activities is to be expected.

2. *Foci of the Information Sciences*

Education in the information sciences should be organized around a number of foci which correspond to the foci of current research and development. They should be implemented as study areas which every student of information sciences is obliged to familiarize himself with and on a selection of which he can concentrate his studies according to his interests and anticipated future career. Apart from the distinction according to professional activities, some areas of emphasis are recognizable which should be used for organizing research and education[1]:

S 1: Theories and methods of information sciences

S 2: Information processes

S 3: Presentation and transformation of data (I):
Theory of symbol structures

S 4: Presentation and transformation of data (II):
Operations on and transformation of symbol structures
S 5: Technology of information systems
S 6: Law and politics of information
S 7: Organization and management of information systems.

The implementation of these study areas within a university requires that:

- intensive research is done in at least one of the study areas
- advanced studies are offered in this area
- introductory lectures, seminars and design studios are offered in *all* the study areas
- it is guaranteed that studio work is offered with real — and not just realistic — information problems on all levels of the curriculum; the typical difficulties of information systems design cannot be simulated by mock-up problems.

3. *Course Structure*

In each of the study areas of information sciences an introductory course as well as a number of intermediate and advanced seminars should be offered. Every student should be obliged to advance in at least one study area to the state-of-the-art. Moreover, in each of the areas a list of elective courses from other disciplines should be offered. They are meant to intensify and widen a student's specialized study in the particular study area.

Studio work should be an essential part of all curricula. Unlike most of the traditional scientific disciplines, which mainly offer lectures and seminars, here practical system-design work should familiarize the information scientist already with the difficulties of working with his real objects.

The educational system should allow for a great variety of custom-tailored individual study plans. It should offer a highly flexible alternative to the present practice in which the student has to subscribe to the programme of a well-demarcated discipline. The intent is to produce the « information conscious » scientist or engineer in many possible unpredictable variations, though all of them share a common body of knowledge and skills. Thus, a student has the possibility of studying « documentation sciences », but also « information sciences with emphasis on documentation » or even « information sciences with emphasis on chemical documentation and its relation to the chemist's research process ».

The course system should be designed according to the following guidelines, choosing the American system of university education:

G 1: At undergraduate level[2] information sciences are only available as a minor subject. We recommend to accept the Bachelor's degree in *any* subject as a prerequisite for studies in the information sciences as a *major* on the graduate level.

G 2: At graduate level the information sciences may become the major subject. Alternatively, the information sciences may be chosen as a minor on the graduate level, leading to a Master's degree in the information sciences. The specification may correspond to traditional degrees (like librarianship) or not.

G 3: Furthermore, students who already have a Master's degree or a diploma in another field should have the opportunity of a second Master's degree or a diploma in information sciences without minors at the end of a comprehensive programme tailored according to the credits a student has acquired before.

G 4: There should be the possibility to study information sciences as a minor subject in connexion with any other major subject.

G 5: For graduates of the information sciences and graduates of other fields who intend to engage in research and/or teaching in this field, and who have the required credentials, doctoral programmes should be established. For graduates of other disciplines additional requirements should be imposed in order to provide adequate preparation in the information sciences at the Master's level.

In connexion with German universities, for instance, these recommendations may seem unusual. However, they also differ from the existing programmes at universities in the USA. However the discussion on university reforms both in the USA and in Germany indicates a direction as envisaged in the programme outlined above. Apart from the claim for democratic participation and more political responsibility at the universities the criticism of the pigeon-hole structure of academic disciplines and of the resulting inflexibility and rigidity of courses is dominant. Determined attempts to correct these deficiencies can be observed at German model universities. The model outlined above tries in a different way to bring about the highly desired adjustment and possibilities of inter-disciplinary connexions. It is essential to abandon the principle of trying to produce standardized graduates whose qualifications — accompanied by a certain amount of education in the liberal arts — are meant to match modern requirements in industry and elsewhere.

Another group of training possibilities should provide post-graduate studies during which practitioners and scientists do not only have the chance to complete programmes on particular subjects and problems in the information sciences — as for instance computerized documentation, user analysis, etc.), but there should also be programmes that offer the entire spectrum of the information sciences in a comprehensive form. Such programmes deserve particular attention since they could be introduced relatively quickly and thus contribute to eliminating the need for practitioners, research workers and teachers.

4. *Individual Study Plans*

The following rules for the combination of individual curricula (for students majoring in the information sciences) are proposed (see tables 1 to 4):

1. For each study area an introductory lecture and laboratory course is offered which is a prerequisite for admission to the proseminars and seminars E 1 to E 7 in that area. All of these courses are compulsory. They should be taken on the undergradute level (if the information sciences are taken as a minor).
2. Also on the undergraduate level, the introductory design course PO has to be taken. It is the prerequisite for the required studio courses P 1 to P 4.
3. Specialization: in at least one of the study areas seminars have to be taken, at least two of which have to be research seminars.
4. From the list of electives assigned to the study area of concentration, at least three have to be taken.
5. Apart from the introductory courses at least three courses have to be taken in the information sciences which are not in the area of concentration.
6. For the Master's degree, besides the introductory courses, at least sixteen courses have to be taken in the information sciences and from the associated electives.

In *Table 1* the cross-hatched area indicates a possible individual course of study that concentrates on study area S 5 « Technology of Information Systems ».

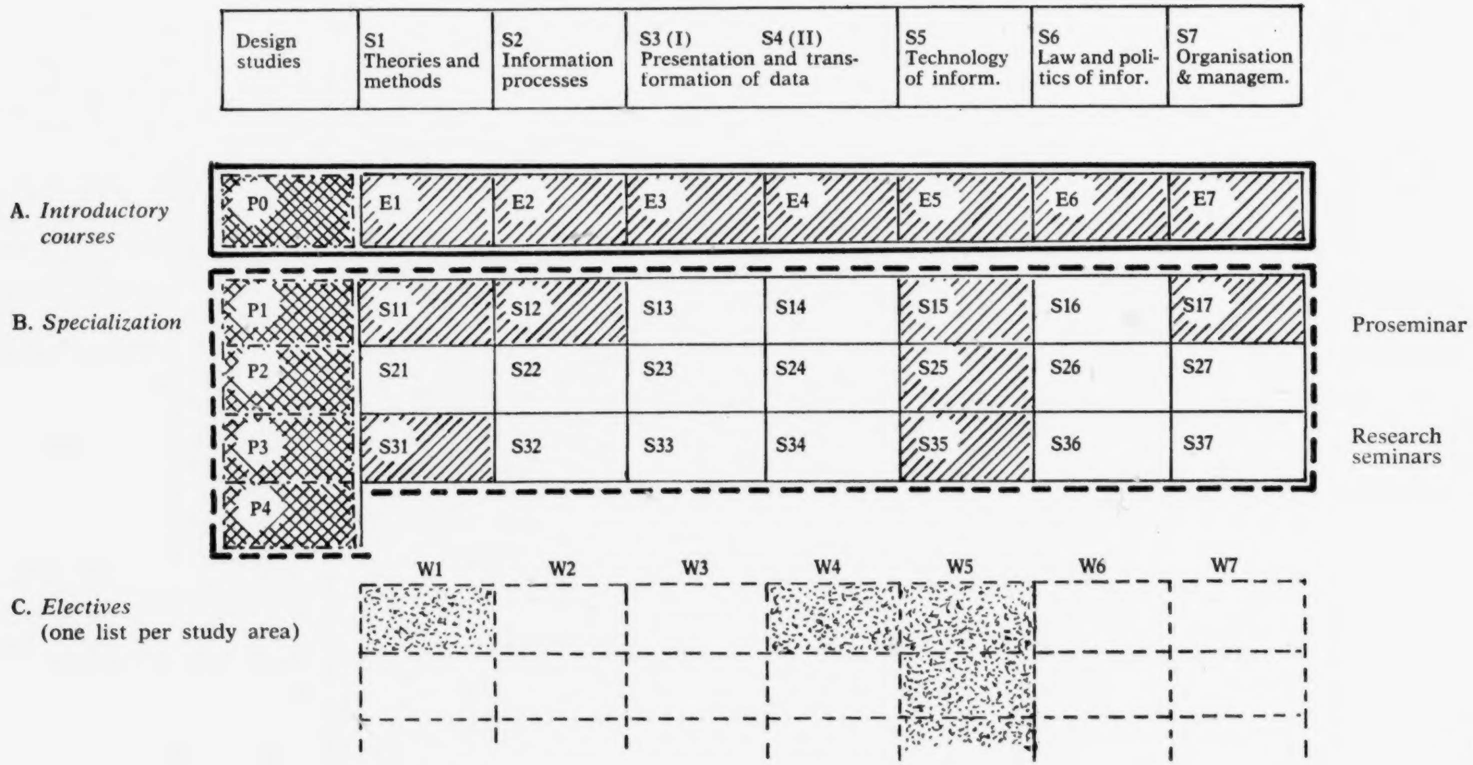
Table 2 shows a possible schedule for a student majoring in the information sciences. For each semester an indication is given of the number of courses that have to be taken in another discipline, in the introductory phase and in the specialization phase, respectively. The table shows that in the undergraduate programme approximately one-fifth of the entire effort should be invested in the information sciences, whereas after the BA or BS it should amount to four-fifths.

Table 3 shows a possible course of studies for a student who has chosen to switch to information sciences as a major as late as after the BA examination.

Table 4 shows the possible case of a student taking information sciences as a minor subject.

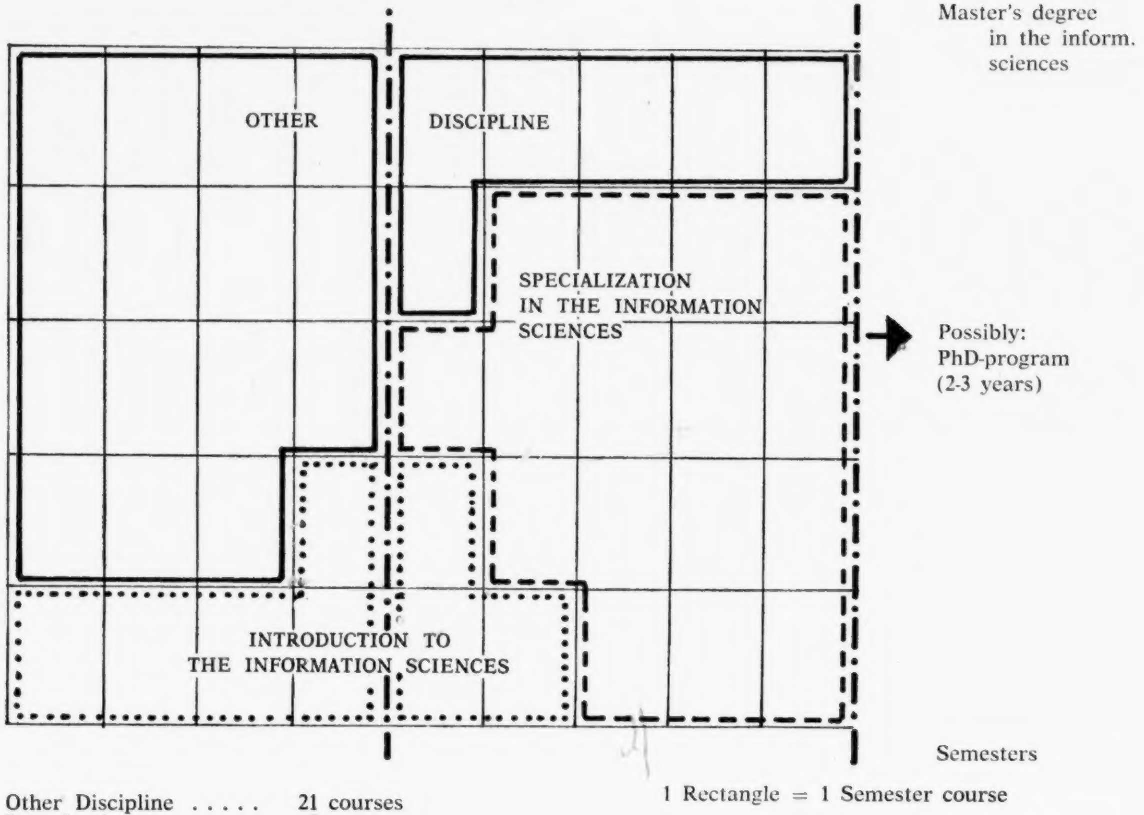
Table 1 - CURRICULUM STRUCTURE

Study areas and specializations



	Design studies	S1 Theories and methods	S2 Information processes	S3 (I) Presentation and trans-	S4 (II) formation of data	S5 Technology of inform.	S6 Law and politics of infor.	S7 Organisation & managem.	
A. *Introductory courses*	P0	E1	E2	E3	E4	E5	E6	E7	
B. *Specialization*	P1	S11	S12	S13	S14	S15	S16	S17	Proseminar
	P2	S21	S22	S23	S24	S25	S26	S27	
	P3	S31	S32	S33	S34	S35	S36	S37	Research seminars
	P4								
C. *Electives* (one list per study area)		W1	W2	W3	W4	W5	W6	W7	

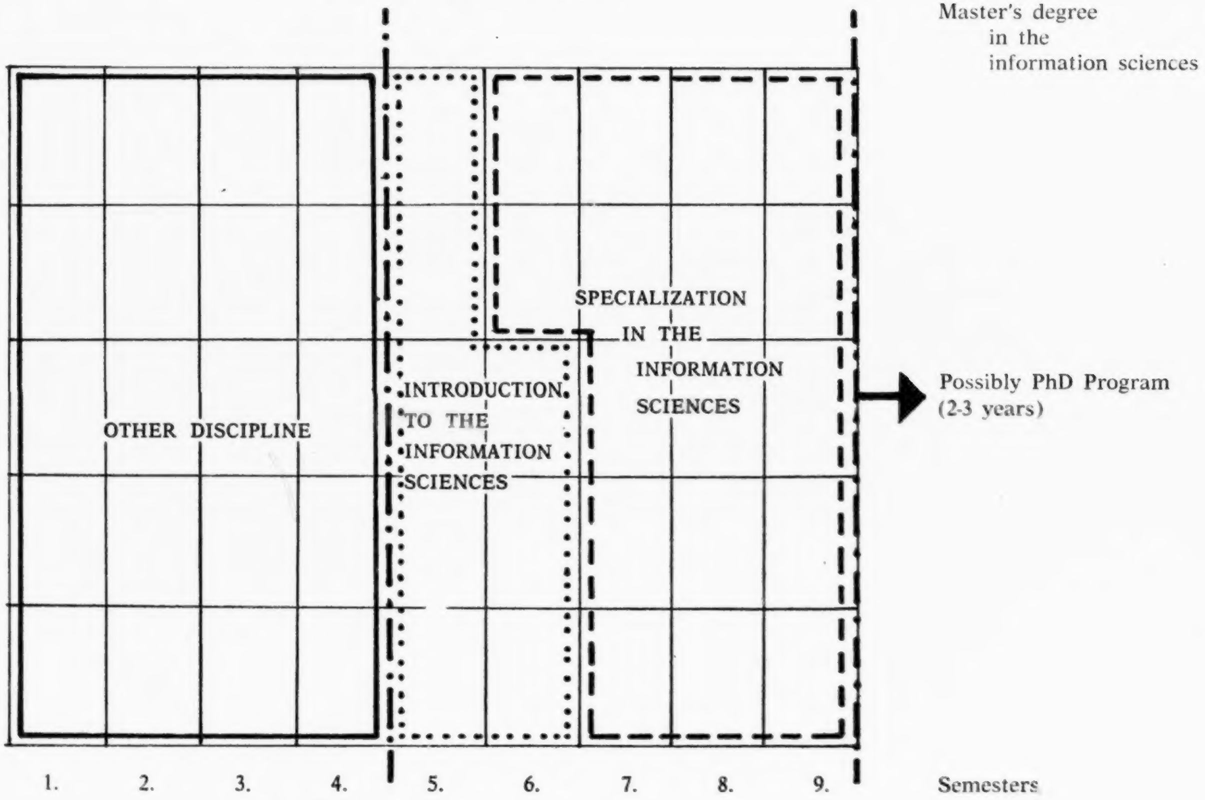
Table 2 - MAJOR IN THE INFORMATION SCIENCES
Case (1), Basic scheme
BA or BS in other fields


Master's degree in the inform. sciences
OTHER
DISCIPLINE
SPECIALIZATION IN THE INFORMATION SCIENCES
Possibly: PhD-program (2-3 years)
INTRODUCTION TO THE INFORMATION SCIENCES
Semesters
1 Rectangle = 1 Semester course

Other Discipline	21 courses
Introduction	8 courses
Specialization	16 courses
Total	45 courses

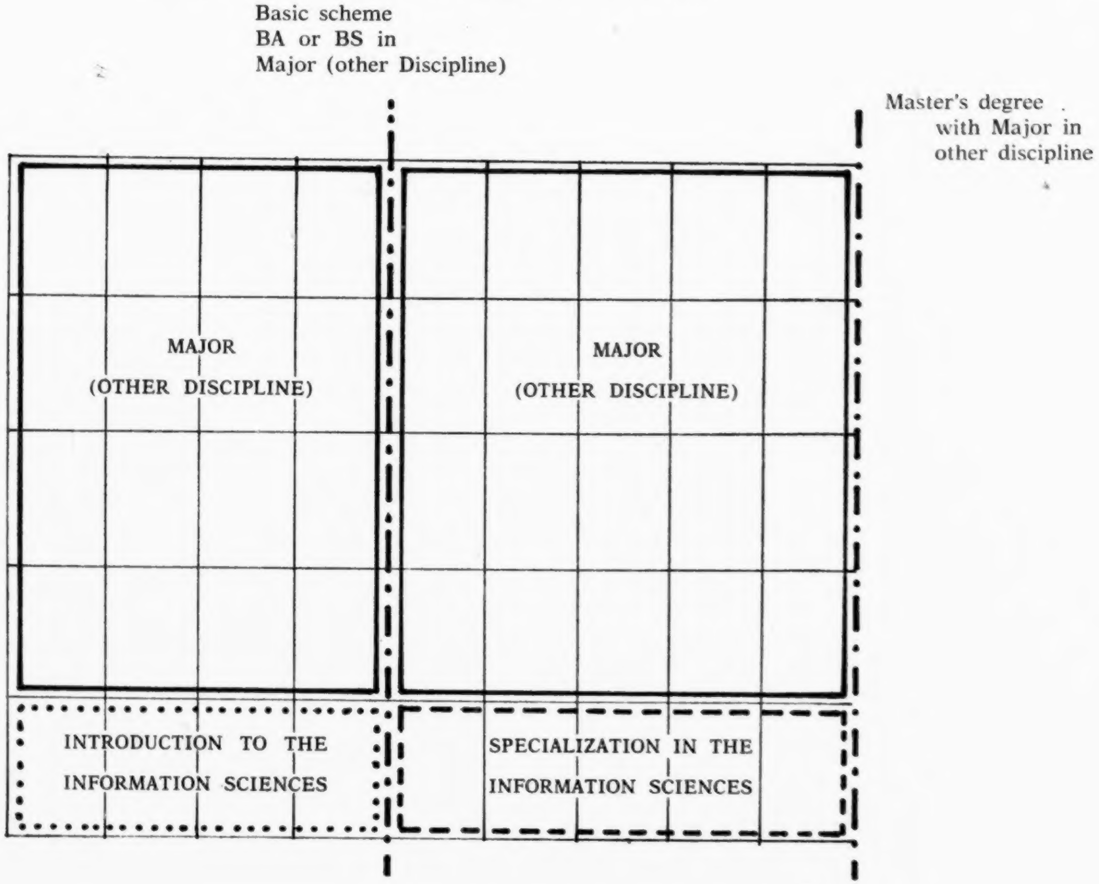
Table 3 - MAJOR IN THE INFORMATION SCIENCES

Case (2), Basic scheme
BA or BS in other Discipline


Master's degree in the information sciences
OTHER DISCIPLINE
INTRODUCTION TO THE INFORMATION SCIENCES
SPECIALIZATION IN THE INFORMATION SCIENCES
Possibly PhD Program (2-3 years)
1.
2.
3.
4.
5.
6.
7.
8.
9.
Semesters

Introduction	8 courses
Specialization	16 courses
Other Discipline	21 courses
Total	45 courses

Table 4 - INFORMATION SCIENCES AS A MINOR


Basic scheme
BA or BS in
Major (other Discipline)
Master's degree
with Major in
other discipline
MAJOR
(OTHER DISCIPLINE)
MAJOR
(OTHER DISCIPLINE)
INTRODUCTION TO THE
INFORMATION SCIENCES
SPECIALIZATION IN THE
INFORMATION SCIENCES

5. *The Demand For Information Scientists*

A conservative estimate of the annual demand for information scientists — and therefore for graduates — in a country like the Federal Republic of Germany is about 600. Assuming a working life of forty years, this estimate yields a stable total of about 20,000 information scientists (which would be reached after about thirty years). It rests on studies that were made in Sweden and Great Britain, i.e. in countries with similiar socio-economic structures. Since these studies mainly refer to « traditional » information scientists (dealing mainly with STI) the above mentioned estimates should be regarded as conservative minima.

There are studies that show that already by the end of the seventies almost fifty per cent of the US gross national product will fall to the « knowledge sector ». This figure includes fields like education and research, in which by no means only information scientists in the sense of the definition given above will be employed. Such figures indicate, however, that the understanding of information as a « good » besides capital goods and consumer goods will very probably create a correspondingly high demand for information engineers, scientists and managers. Such a development would undoubtedly falsify the above-mentioned estimate by order of magnitude.

REFERENCES

[1] For 1971 the detailed description and explanation of this proposal, cfr. Kunz/ Rittel, *Die Informations wissenschaften Ihre Ansatze, Probleme, Methoden und ihr Aushbau in der Bundesrepublik Deutschland,* Oldenbourg: Munchen.

[2] Here it is assumed that the American Bachelor's degree approximately corresponds to the German 'Vordiplom' and a Master's degree to the German 'Diplom' of a science. In the temporal schemes, however, the German system was adopted which is based on a semester system of study until the Diploma examination.

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PROF. HORTST RITTEL studied mathematics, phsyics and Sociology at university. He is at present Professor of the Science of Design, University of California, Berkeley. His research activites cover: operations research in industry, planning and organization of scientific research, pratical application of decision theory, transfer of knowledge into new fields of application, methodology of planning and design, evaluation methods for planning, basic research in the information sciences, concept of academic education for information scientists, systems analyses of the logic of research process, systems analyses in government agencies, e.g. Federal Chancellery, German Bundestag.

A PROPOSED UNDERGRADUATE PROGRAMME FOR TRAINING SCIENCE LIBRARIANS IN ISRAEL

by
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Israel's growing need for speedy and efficient access to scientific and technical information is hampered by lack of scientifically trained personnel due to shortage of supply over demand for such personnel in all fields, failure to award graduate degrees in librarianship/information science, the often relatively low status and pay of librarians and information workers and failure to appreciate the vital rôle of scientific/technical libraries and information centres is governmental and industrial spheres. The need for a basic and advanced degree in librarianship/information science is emphazised and a description given of a proposed adaptation of a very intensive programme of science, engineering and education courses for the training of technical librarians and information officers. The emphasis is on the scientific content of the course. The librarianship courses are aimed at teaching the basic concepts, the use of literature for practical problem solving, the independent running of small industrial libraries or information centres or efficient service on the staff of larger libraries.

This paper presents a proposed undergraduate programme for technical librarians leading to the degree of B. Sc. It was developed in Israel in response to Israeli conditions but it may prove suitable for other countries as well.

One result of increasing development and industrialization in Israel is the increasing need for timely and effective access to scientific and technical information. To some extent this is reflected by a growing number of government and industrial libraries and information centres. The amount of academic research is also increasing as are the number of programmes offered and the number of students studying scientific and technological subjects in Israeli institutions of higher learning. Lack of suitable personnel hampers the operations of existing libraries and imposes severe constraints on the expansion of their services and on the opening of new libraries where required.

Many positions in scientific and technical libraries and information centres call for personnel with a firm foundation in the natural sciences and engineering supplemented by appropriate training in librarianship and information science. The aforementioned positions include those of information officer, reference librarian, book selector, and classifier.

Qualified applicants for these positions are not always easy to find even in the highly developed countries. In Israel the problem of locating suitable personnel is further compounded by the following factors:

a. generally small supply of scientifically trained personnel in relation to the number of openings;

b. lack of experience with librarianship as a recognized *academic* profession;

c. failure to understand the rôle of scientific and technical libraries and information centres in governmental and industrial settings;

d. the fact that no graduate degrees are conferred in the fields of librarianship and information science. The Library School at the Hebrew University in Jerusalem offers a two year post-graduate programme but awards its graduates only a « certificate in librarianship ». Students in other fields who make a similar effort are awarded a Master's degree;

e. the often relatively low status and low salaries accorded to librarians and others in information work.

Considering these factors there is, in Israel, almost no incentive for new graduates in science and technology to enter the field of librar-

SEMESTER I	SEMESTER II	SUMMER SESSION
	FIRST YEAR	
Differential and Integral Calculus Modern Algebra General Physics General & Inorganic Chemistry Libraries and Librarianship	Differential and Integral Calculus Modern Algebra General Physics General & Inorganic Chemistry Organization of Science & Science Information	Numerical Calculus & Programming Introduction to Computer Programming
	SECOND YEAR	
Differential Equations Strength of Materials Materials Modern Physics Technical Services in Libraries Subject Approach to Information	Vector Analysis Thermodynamics Strength of Materials Processes Reference & Bibliography in Science and Engineering Documentation	Dynamics Introduction to Electrical Engineering Elements of Machines
	THIRD YEAR	
Elements of Machines Fluid Mechanics Electrical Engineering Statistics Theory of Machines Cutting Machine Tool Parts	Elements of Machines Viscous Flow & Heat Transfer Theory of Measurement Automatic Control Theory of Machines Metal Cutting Technical Thermodynamics Library and Information Centre Administration	Special Project

ianship and even less to enrol in Library School. It therefore seems reasonable to establish the Bachelor's degree as the basic degree in scientific librarianship with advanced degrees for those who wish to do advanced work or research in librarianship and information science.

Some years ago Israel experienced a similar problem in relation to science teachers. The Technion-Israel Institute of Technology contributed to the solution of this problem by establishing a Department of Teacher Training. This Department provides a very intensive programme of science, engineering and education courses. Examination of this programme led me to believe that it could be adapted to the training of technical librarians and information officers. The table on page 224 presents a proposed course of study based on the Mechanical Technology option as described in the 1970 Technion catalogue. Introduction of the credit system in the Technion in 1971 will, of course, result in some changes in coming years.

The emphasis is on the scientific content of the course. The courses in librarianship are intended to:

a familiarize the student with the concepts of librarianship and information science;

b. enable him to use the literature in finding solutions to practical problems;

c. operate a small (one professional) industrial library or information centre independently as well as perform effectively as a staff member in a larger library.

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TRAINING OF AUDITORS OF INFORMATION SYSTEMS

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The increasing complexity and specialization in information technology calls for careful consideration of the training of auditors to serve as liason between information specialists and users, which should include basic knowledge of computer techniques, programming languages and information flow techniques.

Auditors and Information Systems

In all aspects of information work auditors of information systems appear to occupy a rather unique and somewhat awkward position: they are neither information specialists nor information users. If we conceive information specialists as those who perform the important task of bringing the capabilities of computers closer to users, clearly auditors do not belong: the auditing standard of independence requires that they do not engage in activities that they are to audit. On the other hand, if we conceive information users as those who make decisions based on information provided by specialists, auditors are equally out of place: by definition, auditors are not decision-makers but provide the attest function.

Given this scheme of classification, the rôle played by auditors in connexion with information systems has been somewhat neglected. This is unfortunate, since, in the author's opinion, auditors of information systems provide an important service: as a liaison between information specialists on one the hand and information users on the other. Indeed, this service will become even more important as information technology becomes more complex, as functions provided by information specialists become more specialized and as information users become more perplexed. Accordingly, this paper attempts to discuss some developments concerning the training of auditors of information systems.

Recommendations Concerning Auditors' Knowledge About Information Systems

Because computers were first developed and used in large numbers in the United States, it is not surprising that auditors in that country were also the first ones to recognize their impact. In a definitive study on the body of knowledge to be possessed by certified public accountants, the following recommendations are made:[1]

1. That beginning CPAs be required to have basic knowledge of at least one computer system.
2. That they have knowledge of at least one computer language (e.g., COBOL).
3. That they possess the ability to chart or diagram an information system of modest complexity.
4. That they have the ability to design an information system, prepare a program for it and carry their work through the stages of debugging and testing.

A similar, but independent, study in Canada results in the following recommendations: [2]

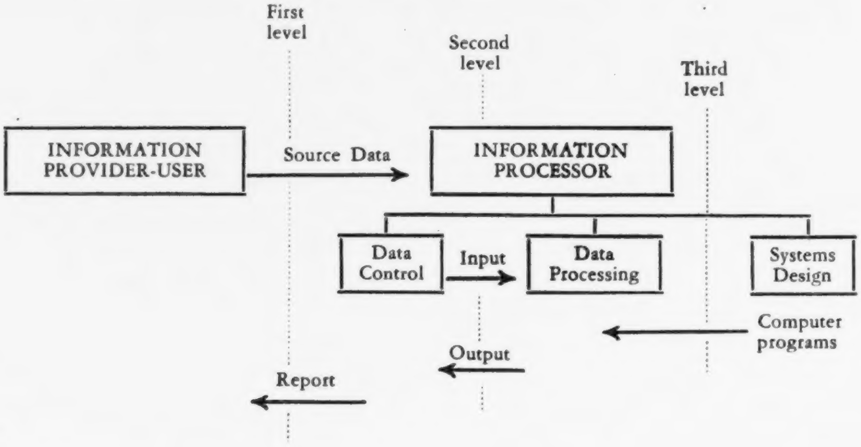
The committee estimates that some twenty days will be required to acquire the proposed body of knowledge of computer technology. The suggested division of time between each of the main topics is as follows:

— computer systems — seven days
— programming languages — three days
— systems design — six days
— audit — three days
— computer applications — one day.

It is clear that these recommendations are made not with the objective of qualifying auditors as information specialists, but rather, of equipping them with some proficiency in the course of discharging their professional responsibilities as auditors.

Auditors' Concern for Internal Control

One of the auditing standards requires that auditors study and evaluate the system of internal control. In a computer-based-information-system environment, this process involves three levels, of which the inter-relationship may be shown diagrammatically.


First level
Second level
Third level
INFORMATION PROVIDER-USER
Source Data
INFORMATION PROCESSOR
Data Control
Input
Data Processing
Systems Design
Computer programs
Output
Report

Briefly, the first level, which is well understood among auditors, relates to a study of organizational relationship and structural independence between information processors and information provider-users. The second level is concerned with a review of the organizational structure within the information-processing function; ideally, activities relating to systems design and programming, data processing, and data control should be separated. The third level is concerned with a review of programmed checks built into computer programs; ideally, unusual conditions should be displayed on the computer console for human attention.

In order to handle each of the three levels properly, it is clear that auditors require proficiency in flowcharting and programming languages similar to those recommendations presented in the preceding section.

Auditors' Concern for Documentation

The auditors' need to review programmed checks built into computer programs leads them naturally to another important area: review of documentation. Although final responsibility for program acceptance generally rests with information users, their lack of time, interest, and/or knowledge provides auditors with an opportunity to serve information users and specialists alike. When auditors are satisfied with the review of documentation, it suggests to information users that information specialists have given proper attention and care in the conversion process. Generally, adequate documentation should include problem statement, system flowcharts, operator instructions, record layouts, program flowcharts, program listing, test data, as well as approval and change sheet [3]. Again, proficiency gained by following recommendations shown earlier would be extremely helpful in this review.

Auditors' Concern for Data Reliability

In addition to studying and evaluating internal control and to reviewing documentation, auditors must also be satisfied with the reliability of data as produced by computers. Since these data are generally stored in machine-readable form, auditors, with the aid of computer audit packages,[4] have an opportunity to use computers as an audit tool. This development further illustrates the need to train auditors to be proficient in computer-based information work.

Summary

Given the increasing complexity in information technology and more specialization in information work, training auditors as a liaison between information specialists and information users deserves attention. This may be accomplished by giving auditors some understanding of the information-flow process, computer concepts, and programming languages.

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TRAINING OF DOCUMENTALIST LIBRARIANS AT THE STATE INSTITUTE OF SOCIAL STUDIES, BRUSSELS

by
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A very detailed analysis is given of the documentalist-librarian diploma course at the State Institute for Social Studies, the sole training of its kind provided in Belgium. Staffed by Diploma librarians and documentalists of long experience and attended by nationals and foreigners, the training covers three years and three types of courses: general *(mainly in first year, devoted to exact sciences and humanities),* technical *(three years, taking most important position in second year),* languages *(3 years).*

The documentalist librarian section was created in 1964 by the Minister of Education and Culture, to replace the specialization of « Librarian Social Assistants » that had existed at the State Institute of Social Studies since 1922.

In Belgium, the teaching of library economy or librarianship started as long ago as 1897, for those employed by the State, and 1911 for staffs of other libraries. Since the beginning of this first « school of books » it has been noticed that documentation is intimately tied up with the training of librarians, as evidenced by the permanent presence of the secretary general of the International Bibliography Institute — later to become the International Federation for Documentation — on the list of teachers.

1922 saw Paul Otlet, the founder of the documentation movement, in charge of courses at the Institute of Social Studies (at this time the Central School of Social Service).

The section forms part of the first grade higher technical education and at present covers three years of studies.

This Institute is the only one in Belgium — thanks to its fully operative teaching activity — which trains young people of both sexes who wish to become documentalist librarians. In order to gain entry to these courses, they have to possess an approved diploma in the humanities or an examination of equal standing.

I. Composition of the teaching staff

The courses are run by holders of university or higher technical diplomas, who possess long experience in libraries or documentation centres, since in Belgium training for documentalists or librarians does not exist, as such, at university level.

The permanent staff of the section comprises diploma holding librarians who have served fairly long periods in a library or a documentation centre.

II. Courses for students in the section

The training of documentalist librarians includes three types of courses: general, languages and technical.

Most of the general courses are in the first year, technical courses hold the majority position in the second year, and the languages courses cover all three years.

As from the second year, the students choose either the humanities or the exact sciences, according to the line they wish to take.

On-the-job courses are run in the second and third years. They aim to familiarize students with the functioning of the places in which they will later carry on their profession. At the beginning these courses are held in libraries of various types, while in the third year firms are chosen according to the subject of the student's « report ».

Studies end in September of the third year, and a diploma is awarded following submission to a jury of a report containing at least a hundred typewritten pages. This work is drawn up between January and June of the final academic year. A staff member of the establishment acts as « report supervisor ». Students are followed very regularly, first fortnightly and then weekly.

The report subjects are chosen in various fields concerning librarianship or documentation: technical questions, studies of libraries of certain types or relative to such and such a field, state documentation examination in certain disciplines; study of types of documents (e.g. journals, rare journals, manuscripts, newspapers, etc.), analysis of content of documents, etc. Choice is made at the very start of the third year, by common accord between the staff and the students.

Throughout the courses there are organized visits to libraries, documentation centres or services, or to other organizations concerned with books. Reports on these visits have to be drawn up by the participants. Practical work is likewise arranged regularly, in order to give a concrete outlet to the theoretical instruction.

The content of the courses is as follows:

a. *General courses:* in the first year, training is general and based on an ensemble of courses devoted to the exact sciences and the humanities. After the first year, the students are given an opinion by the teachers of the exact sciences and the humanities regarding their choice for the second year.

According to the options chosen, the disciplines concern either political science, economics, law and philology, or physics, mathematics, chemistry, statistics, natural sciences and industrial technology.

In all, 1017 hours are devoted to the humanities and 1086 hours to the exact sciences.

The content of the general courses aims, in the first months of the first year, to level out the very disparate standards of study reached by the participants. In fact, students come from all over Belgium and also from abroad (in some years one-fifth of the total). After this period and especially in the second-year course, an attempt is made to give information on topical problems posed in the humanities, natural science or applied subjects, rather than an attempt to provide masses of knowledge without going deeply into anything. For documentalists, as also for librarians, the most important problem is knowing the latest facets of the question rather than its historical development.

b. *Language courses:* the languages offered are Dutch (spoken), English (a thorough knowledge of the language, both written and spoken, is necessary), German, Italian (very useful in the European context) or Spanish (essential for the international market) or Russian (preferable for those choosing the scientific option).

These languages (totalling 864 hours in the three years) are indispensable because they will permit the documentalist librarian to understand texts in them, possibly to abstract texts, and to converse with foreign readers, or to answer questions from foreign organizations. Moreover it is desirable for librarians and documentalists to step up their participation in international technical meetings, and for them to be able to understand and to express themselves in the major world languages.

The teachers of the technical courses very frequently assign work which requires varied linguistic knowledge (e.g. analytic summaries of foreign language texts).

c. *Technical courses:* These courses (864 hours over the three years) cover instruction in the techniques necessary to trace, record, select, distribute and retain the information (on any support) for users employing manual or mechanical techniques.

On-the-job courses serve to illustrate the lessons. At present there are 792 hours of such courses spread over two years.

They include the following subjects: librarianship, history and technique of books, publishing, bookselling, the organization of public libraries, special libraries and documentation centres and services, bibliography and reference works, distribution of information, reader psychology, etc.

The longest course is library economy or librarianship, which is then followed by documentation, and it contains the following sections: history of libraries, construction and equipping of premises, furnishings, choice and acquisition of collections, special sections, cataloguing, classifications, lending, conservation, administrative questions, public relations, libraries in various countries and special libraries. Documentation includes: definitions and types of documents, organizations, staff, document acquisition, special collections, documentary works and international regulations, distribution of documentation, techniques applied to documentation (general questions, terminology, coding systems, manual or mechanical punched cards, the rôle of telecommunication, the use of photography, readers, mechanical applications of semantic or systematic classifications, the use of computers, automation of documentation, future prospects.

These subjects are spread over the three years in the order given above. Continuing the librarianship course, this starts up in the second year and ends in the third.

From the second year, many hours of practical work are envisaged, to prepare catalogue cards on different types of works on different subjects. The volumes required for this deal with different subjects and permit the practical application of the knowledge acquired in the general courses to classify the subjects and obtained reasoned catalogues. The different languages concerned lead to a fresh application of the language courses. In fact, all the courses lead up to such works.

In the second year the teachers of the technical courses get students to draw up bibliographies on set subjects. The teacher of the reference course has his students make « dossiers » on a topical theme. These works are included in the student's rating for the year.

In the third year, students have to prepare not only the report already mentioned, but also a number of an analytic bulletin. This manuscript is supposed to be the first of a publication appearing regularly, including all the tables necessary for easy consultation and to be presented in such a way as to be easily printed by a publisher.

The practical assignments aim at putting students in situations as close as possible to actual ones.

LIBRARIANSHIP COURSE under G. LORPHEVRE

1. *HISTORY OF LIBRARIANSHIP:*

   Antiquity: Egypt, Assyria, Ancient China, Greece, Rome.

   Middle Ages: Vatican, the Laurentian, evolution of lectern system, chained works.

   Modern times: The mural system started at the Escorial, Wren's works, the Paris Bibliotheque Nationale, works of Labrouste, the British Museum, the US Library of Congress.

Evolution of premises from ancient buildings adapted to modern libraries; various systems: round, towers, etc.
The great modern libraries: Berne, Manchester, the Canadian National Library, the Albertine, Louvain.
Library-stores (« Winkelbibliotheken »). Radial access, the « carrel » system in study libraries. Free access to stores.
Size regulations.

2. *CHOICE, CONSTRUCTION AND EQUIPPING OF PREMISES*

What is to be included and what excluded.
Use of premises.
Situation of premises compared with environment.
Adaptation of premises or construction.
Free access, without free access, deposit libraries.
Building libraries of various types: rectangular, round, towers.
Distribution of services in rooms; development of services in time.
General recommendations in event of building: walls, bays, doors, stores, work rooms, conveniences, rooms for bibliobus, garages, internal transport.
Heating, lighting.
Temperature, humidity.

3. *FURNITURE*

Its evolution (see also: construction of libraries)
Choice of materials: wood or metal. Pros and cons.
Shelves: types, fixing, carpentry, fixed, mobile, collapsible shelving.
Securing of works: removable or fixed.
Labelling the shelves, bays, etc.
Ladders.
Furniture for special collections: atlas, daily papers, periodicals, maps and plans, etc.
Brochure cases, archive bags.
Compact systems.
Tables, seats, arrangement of reading rooms (for young and adults).
Size norms and regulations.
Catalogue rooms: card indexes (various types), visible cards, various markings.
Furniture for objects and documents in horizontal position.
Photographic equipment (developed in the course of documentation).

Internal transport material (fixed installations, see: construction)
Librarian's desk.

4. *CHOICE OF ACCESSIONS*

Choice: composition of fund according to types of library.

- Gear necessary for choice of books and periodicals.
- Co-operative accessions plans: Farmington, Scandia, use of collective catalogues to facilitate choice.
- Reference works.

Accessions: Theories: liberal, humanist, revolutionary.

- Survey prior to purchase.
- Accession proper (purchases: rôle of book distributors; exchanges: organization of operation, depots of works by third parties).
- Orders and supervision of orders.

Entry: verification, bookkeeping operations (Inventory: see catalogue); placing of « ex libris », etc.

Deposit: Choice of works to be placed therein.

Doubtful section: choice of works to be placed therein.

5. *CATALOGUING*

A. *Terminology:* explanation of a hundred or so terms. History of catalogues.

B. *General:* distinctions to be made between catalogues and bibliographies, sorts. Making of catalogues.
Quoting, classification.

C. *Types:* wall, numerical, entry register (or card index), topographical (the oldest), according to title, to header word, typical word, analytical (rules and exercises), « uniterm », dictionary. Collective catalogues.

D. *Making of card* (according to Vatican and Library of Congress rules, ISO standards and results of the 1961 international conference).

1. format of cards, arrangement of elements, IBN's standards
2. Determination of author:
   surname: authors ancient and modern, foreign names, of married women, etc.

Christian names, simple and compound, variants, the Christian name as the main element

pseudonyms, anonymous works, authors who sign with asterisks or other marks.

Case of more than one author

Collective authors

Religious personnages

3. Determination of title of work
4. edition (distinction between edition and printing)
5. bibliographical adress (Place, publisher, date, chronograms)
6. collation (size, pages, illustrations)
7. notes (the ten conventional notes, the ten informative notes).

E. *Alphabetizing.*

Works published together — anthologies, extracts, fables, plays, proverbs, popular songs, riddles, etc.

— Bible
— critical editions
— works revised and corrected
— summaries of works
— translations
— libretti
— accessory parts of a work by authors other than main author
— periodicals
— series, collections
— theses and university works
— geographical maps and plans
— musical scores
— see also documentation para. 4
— illustrations
— correspondence
— collections of laws, etc.
— editions of texts of documents
— miscellanies, anniversary works
— memoirs

Catalogue of reproduced documents (photocopies, microfilms, etc.)

F. *Transliterations.* The rules for the Cyrillic, Arabic, Hebrew, etc., alphabets. Retransliteration. Romanized scripts for languages without alphabets.

G. *Writing:* use of capitals, punctuation and other marks.

H. *Rules or publication of catalogues* (after types of libraries). Methods of reproduction to be recommended.

6. *CLASSIFICATIONS*

a. alphabetical order: rules to follow, name, titles.
b. the Cutter system and systems derived therefrom.
c. history of systematic classifications (choice of about thirty systems from Middle Ages to our time)
d. decimal classification: Dewey and UDC
e. Documentary language (cf. documentation).

7. *LENDING*

Reader card
Bulletins: with or without counterfoils
Single card system, register, register-journal
Bulletin of on-the-spot borrowing
Lending in firms
Circulation of periodicals.
Reminder of loans.
Inter-library loans: use of collective catalogues, technique of catalogues.
Circulating library: postal libraries, bibliobus (book-buses), bibliofer, bibliotram, rural roading.
Photographic registration of loans.
Negative track control.
Multicopying treatment applied in lending service.

8. *CONSERVATION*

Deterioration due to natural elements, by readers, disinfecting
Resticking
Prescriptions of library economy for bindings

9 *ADMINISTRATIVE QUESTIONS*

Administrative committee
The librarian (functions, training, types, etc.)
Regulations
Budget and accountancy
Publicity (tracts, reader publicity, press, radio, T.V.)
Lectures in libraries
Extensions of the library: book deposits, book-buses, etc.
Exhibitions in libraries or with the assistance of libraries.

10. *PUBLIC RELATIONS*

The family, the school, works.

11. *LIBRARIES IN DIFFERENT COUNTRIES*

Administrative organization, main types, legislation, etc.
France,
Denmark,
Belgium,
U.K.,
U.S.A.

Universal documentation network.
International action: International Federation of Library Associations. International loans, international library economy initiatives. Action of such international organizations as UNESCO, OECD, the Organization of American States, etc.

12. *SPECIAL LIBRARIES*

What is to be understood as a special library? Difference compared with national, public libraries, etc.

a. Libraries for a public in special circumstances: hospitals, prisons, the army, the blind, children.

b. Libraries for a restricted public: e.g. medical, agricultural.

c. Scientific and industrial libraries: passage to documentation.

COURSE OF DOCUMENTATION

1. *Introduction:* definitions, general points on documents. The parts of documentation. Initial, primary, secondary, derived documents. How is the document presented? Criticism of value, sincerity competence, etc.

Things that go towards the expansion of documentation: associations, congresses, international organizations (OIG and ONG). Standards in the field of documentation. Action by the ISO and its technical committees; national standards.

2. *Documentation organizations* (aim, rôle, administration, etc.) *Staff.* The central Documentation units (libraries, archives, etc.).

Documentation centres (national or international).

Documentation services or offices. Documentation initiatives.

Specialized centres. Relations among doc. centres and scientific research. Doc. networks: national, international (general or special).

3. *Acquisition of documents:* difference compared with those of libraries. Case of books, periodicals, documents not normally published (reports, etc.).

Methods of acquisition, importance of exchanges of documents.

Functioning of national and international exchange services.

4. *Treatment of collections.* For periodical books and certain special documents, see Librarianship: documentary dossiers, iconography, reprography (printing including offset, typing, photography, various processes: flat, hectography, stencils, microfilm, microfiches, xerox, thermocopying, selective distillation, etc.), commercial catalogues, sound documents (cylinders, records, wire, tapes, etc.), museum and scientific objects, models, etc. Scientific material and equipment as the object of documentation.

Administrative documentation.

5. *Documentary works:* Examination of documentation: analytic, descriptive, integral, by translation, by partial reproduction or complete reproduction. Establishment of documents in documentation centres and services, summaries, indexes and tables; preparation and publishing of periodicals, etc.

Usual norms for such works and especially those concerning abbreviations, periodicals, bibliographical references, etc., those for patents and translations, documentary analyses.

6. *Distribution:* on the spot, through conferences, seminars, congresses, etc.

Teaching. Publications distributed through the service or the centre: periodical, non-periodical, rules of presentation, editing (ISO/IBN).

7. *Technical means-automatic documentation:*

a. general problems: terminology, types of documents to be coded, coding systems, linguistic problems.

b. processes, selection manuals: punched cards (marginal, central, etc.). Peek-a-boo cards, pre-punched cards.

c. rôle of telecommunications: telex, radio, T.V., punched tape, the international telegraphic code.

d. rôle or photos in distribution and selection processes (Samain system, minicards, etc.).

e. reading machines and linguistic and writing problems stemming therefrom.

f. address plaques, a new development for automatic documentation in this field.

g. automatic and electronic printing: Linotron, etc.

h. eighty and ninety column cards: documentary and scientific applications, administration of services and centres, document retrieval, data retrieval, detection of anonymous works, author identification; reconstitution of texts, etc.

i. use of computers: special coding systems (see a)), especially binary, applications of computers to documentary and scientific works.

j. mechanized applications of thesauri or of UDC. Arrow diagrams. Problems of unlinguism of codes based on natural language.

k. linguistic questions: projective languages, programming languages (Fortran, Algol, Cobol, etc.), semantic networks. Thesauri, difference between key words and descriptors (see also classifications in librarianship). Rôle indicators.

l. Towards a fully automatic documentation; interconnexions, compatibility of systems and material. INIS, MARC II projects, etc. Automated bibliographies now in existence (national or special).

m. document economy: applied to documents: *a.* quantification (production statistics), determination of literary cycles, primary and secondary documents; *b.* content of documents: author determination (linguistic statistics), analysis of contents (of support, of message, of audience); *c.* content of bibliographies. Applied to collections: methods of judging the programme of a library (regulations in effect), evaluation (Cleverdon and Salton).

PROF. G. LORPHÈVRE is Director of l'Office International de Bibliographie - Mundaneum, Le Centre National de Bibliographie - Mundaneum, Les Amis du Palais Mondial - Mundaneum, Le Musee de la Presse, Le Biblioteque Mondiale, Les Editiones Mundaneum, Brussels.

UNIVERSITY TRAINING OF JURISTS IN INFORMATION WORK

by
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As compared with other humanists, jurists in Italy are at a cultural disadvantage since neither the universities, the public administration nor the professional societies have done anything to train jurists in the utility and the techninques of automated information. This has resulted in incomprehension and rejection of the problems posed by informatics. It is suggested that the establishment of appropriate university departments could provide a suitable environment for overcoming this situation.

1. Jurists are the rear-guard of a small army of documentalists who, during the course of the last century, subverted venerable institutions and proposed new systems of classification and bibliographical research. They also form the rear-guard of the battalion of social scientists who, as a consequence of recent developments in information science have for the past fifteen years been considering the social consequences of automation and working out its applicability to various fields having diverse objectives.

It will not be an easy task for jurists to make up for this cultural lag which has involved, as does every cultural lag, the rejection, therefore the lack of understanding, of problems and methods.

It must be acknowledged that in certain countries (the United States, France, Czechoslovakia and some others) jurists have been the first to react to this cultural lag, having been stimulated, often, by workers from other social fields. In the past few years much has been written and there have been many conferences to which jurists have been invited to contribute in order to update theory and method.

2. Research in two directions is indicated. These correspond to two aspects of the above-mentioned updating: participation in automation (for documentation and other branches of work), and reflection on the consequences of automation.

The first task, which is of most interest to participants at this conference, can be split into various sections which I will try to outline briefly.

The second task, which opens up possibilities of inter-disciplinary research, both within the universities and elsewhere, is outside the scope of this Congress. I am bound to emphasize a fundamental factor that often goes unrecognized: no jurist is qualified for such a task of reflection without having first had complete experience of the processes of automation. The lucubrations of jus-cyberneticists who have no experience of work with documents or in the interpretation of data, should be rejected.

3. The participation of jurists in automation (work involving documents and other fields) can be broadly summarized as follows:

a. the definition of the specific requirements of juridical research in so far as the automation of documentation is involved, as opposed to the requirements of research in other scientific fields;

b. with regard to the elaboration of data not connected with documentation, the definition of possible applications, in the juridical field, of research and experimental methods from other fields, or from different systems within the juridical field;

c. the definition, in both cases, of juridical norms, organizational structures, or customs that create delays or constitute obstacles to the introduction of new techniques and methodologies of information.

Besides fulfilling the rôles described above, in the first two cases the jurist is asked to collaborate with information experts. In the third case he is asked to propose the necessary legal changes, and to indicate the means for altering the organizational structures and removing the obstacles inherent in administrative routine and in certain ideas prevalent in the mores of the time.

4. There are many difficulties involved in the training of jurists to carry out one or more of the tasks mentioned above, because of the cultural lag already referred to. The first large-scale experiment strictly in the documentary field was carried out by the Italian National Research Council and the results were not on the whole very satisfactory.

The situation in the Italian public administration is no more promising. The juridical problems brought up by the centres for processing information are resolved in an *ad hoc* fashion. The most important juridical problem, that is the way of setting-up, running and controlling such centres is, on the other hand, completely neglected. There are no regulations for the co-ordination, jurisdiction and administrative responsibility of the centres that process information within the public administration.

In such a situation the only way of training information specialists (jurists and others) is for each sector of the public administration to act autonomously, as though it were a private enterprise. In practice this is what is happening.

At the cost of deplorable waste of men and means, each Ministry (sometimes each General Directorate) and each government-controlled body has its own policies for the distribution of information. Legislation concerning the personnel of these organizations has been drawn up, but the resistance is such that each Administration, as is the case with private industries, struggles to obtain legislation specifically for its own ends and which therefore recognizes certain particular functions and qualifications connected with computing.

Certain Administrations have, in fact obtained the legislative prizes they were angling for, whereas others have not, giving rise to a very confused situation with particularly unfortunate consequences for the recruiting and training of personnel.

This is one of the many cases in which jurists have not fulfilled the functions which society assigned to them.

5. The training of jurists who will be qualified to fulfil this last, and other functions mentioned in section 3, is not being adequately carried out in Italian universities.

. Also in this case the cultural lag is due to legislative, organizational and traditional obstacles. Up 'til the present there has not been a single case at the universities of a project for automatic documentation or processing of data in the juridical field. The same is true of professional legal organizations.

A consideration of this situation shows that Italian universities and professional organizations have an enormous responsibility at the present time. In the United States, France and Belgium, universities and professional organizations have been and are in the forefront of scientific research, and it is within their sphere that the most stimulating experiments have been carried out.

In view of this the Italian cultural lag is a matter of concern. Yet again the universities are out of step with society's requirements, which give the measure of the difficulties to be faced in the qualification of specialists, the setting-up of study programmes and the introduction of research projects.

Among other reasons for this state of affairs the technicism and limitations of academic jurists should be mentioned, for the most part they are incapable of understanding what inter-disciplinary research means, and are in any case hostile to the introduction of new disciplines, whose development they would be unable to control and whose very relevance to the field of jurisprudence they deny.

But we will not discuss this attitude here, rather it is worth while to see how university reform (if it takes place) could contribute to the training of jurists who will be qualified to overcome the cultural lag which cannot be eliminated within the present university structure.

6. The pivot of university reform (or, more exactly, of its positive aspects) is the setting-up of departments. The actual formulation of article 9 of the projected legislation (as approved by the Senate) is, unfortunately, altogether inadequate, and even harmful in that models for departments are to be established once and for all at the national headquarters, *Consiglio Nazionale Universitario* (National Council of Universities). It would be better if each university were to set-up the departments that its resources will allow, bearing in mind the special needs it hopes to fulfil. If this principle, recently put forward by the *Associazione Italiana di Diritto Comparato* (Italian Institute of Comparative Law), is accepted by the *Camera dei Deputati* (Chamber of Deputies) it would be possible to set-up departments of Information Science in two or three Italian universities.

Departments must be centres for teaching and inter-disciplinary research. Mathematicians, physicists, students of the theory of information, linguists, social scientists, jurists, will all be able to contribute to a department of the Science of Information. In this way a reserve of experience and inter-disciplinary research will be built up, which can be drawn on to bridge the cultural gap of jurists and also of other social scientists; in fact it seems difficult to see how this objective could be reached in any other way. It will then be possible for scholars from various fields to discuss problems that are at present altogether outside their competence.

Such a centre would be the environment for the training of information teams. Research into the theory of information could be undertaken, which has so far hardly been applied to the juridical field. It would also be possible to carry out research in the field of social cybernetics and juridical models. Though started some years ago this has not been taken very far in any country, least of all in Italy, where such studies are virtually unknown.

7. The efforts so far made to train people in the juridical field prove that radical reform of the universities is essential before these objectives can be reached.

In more than one Italian university theses have been written and discussed on automatic juridical documentation, or on the application of the theory of information to juridical research. A couple of universities started projects for documentation which were then abandoned. In both cases efforts were made to set-up centres and train students to carry on the work. However in both cases the projects could not be fitted into the existing system and, as a consequence, students from faculties of jurisprudence have not had experience in any real sense of the science of information.

Dr. Maurizio Lupoi was born in Rome in 1942, he is a University Lecturer (Libero docente) in Comparative Private Law at Rome University, and was responsible for the MIDA project for automatic documentation in Comparative Law. Currently, apart from university teaching he acts as a consultant. In 1970 he published, in Quaderni del Foro Italiano, « *Giuscibernetica ed informatica giuridica - Problemi per il giurista* ».

THE IMPLICATIONS FOR SOUTH AFRICAN EDUCATION IN LIBRARY SCIENCE IN THE LIGHT OF DEVELOPMENTS IN INFORMATION SCIENCE

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The information function is regarded as an integral part of the library function and must be included in training. The current inconsistent terminology needs to be standardized and suggestions for this are made. The conclusion is drawn that communication and information science in respect of library science cover one and the same field. From the suggested definitions the following fields of study are identified: 1) documents *(selection, acquisition, indexing, storage, retrieval); 2)* information *(its selection, indexing and storage, and its retrieval, evaluation, and presentation); 3)* information science *as a discipline (study of acquisition, transfer and use of information methods); 4)* management and organization *(reorientation of these factors in light of developments of new techniques and methods in this field and requirements arising from developments in the information function). Closely linked with this item is the study of systems analysis and development. This distinction is necessary if the implications for education are to be formulated with due regard to the scope of the subject field and the requirements of the resulting practice.*

In educating librarians newer trends in the information function as well as the socio-cultural function of the library must be taken into proper account. On this criterion it is suggested that education of librarians in South Africa should cover two types of training: information-directed and socio-cultural directed which are not mutually exclusive. A core of basic study should link the two. This type of training will be service-orientated (two-year B.A. degree course following B.A. in any other field). It should be also offered at a lower level for training library and information technicians and at a higher level for leaders and administrators in both fields. Research-orientated training should be offered at master's level leading to doctoral studies.

The information function

In some circles the view was held that library science had never regarded information science as belonging to its field of activities. Hence the founding of associations such as the Special Libraries Association, instigated by John Cotton Dana, whose teaching led a small group of persons to desert the American Library Association in order to found this new association. Further fragmentation of the library profession occurred with the founding of the American Documentation Institute in the early thirties — an institute originally designed as an association of representatives of learned associations « which were dedicated to the encouragement, development and promotion of new scientific aids (and) to the bibliographic activities of the scholar »[1] and by the founding of the International Federation for Documentation (FID) which was concerned chiefly with furthering the interests of the Universal Decimal Classification.

This was only the beginning of the fragmentation. Numerous other organizations were founded, especially after World War II, when electronic devices were employed for purposes of information retrieval and mechanizing of routines.

It is important to note that the majority of the members of these organizations were natural scientists or persons with a background of natural science, who turned to documentation because they were interested in the problem of retrieving literature. Many of them held librarians in open contempt [2].

Until the middle of the fifties, the interest of these organizations lay in the document and its use. At about this time, however, the interest began to veer towards information rather than the document itself. This soon led to the establishment of organizations concerned with the information problem. No wonder that the American Documentation Institute recently changed its name to the American Society of Information Scientists.

On the other hand, the trend of thought on the new developments was to recognise the information function as one of the basic spheres of library work and the development of special librarianship, documentation science and information science as extensions and refinements of library science. Although the rift between these trends of thought is wide and seems to be ever widening, there are those who believe that at some stage the gap will be bridged. Jesse H. Shera is one of the authors who holds this view and who sees in the information question as we know it today, the possibility « (that it) will be able to give the (library) profession the intellectual enrichment and depth for which it has for so many years been searching ».[3]

He deplores the artificial division between *Librarianship* and *Information work* and maintains that *Documentation* is responsible for this division. He believes, however, that the first two will eventually meet.

Werner W. Clapp, former president of the Council on Library Resources, in his survey of the future of reference work, agrees with Shera's views [4]. In order to emphasise his point of view, he quotes the following words of A. R. Spoffard written in 1876: « Public libraries are useful to readers in proportion to the extent and ready supply of the help they furnish to facilitate researches of every kind. That is the best library and the best useful librarian by whose aid every reader is enabled to put his finger on the fact he wants just when it is wanted » [5]. Of these words Clapp says that they are as true today as the day on which they were written. « If they now seem inadequate, that is not because we have been able to comply completely with their conditions and progressed to a higher plateau of doctrine. Rather, we have come to recognize that the doctrine, as framed by Dr. Spoffard and his successors, down to very recent decades was, in effect, a doctrine of passivity, and we have matched it with a doctrine of initiative.

For the formulation of the latter, we are indebted to special library work. Thus, where the library is typically an organic member of a corporate enterprise, it is natural that it should take the initiative in supplying information rather than wait to be asked. Hence the motto, « Putting information to work »; hence current notation services, selective dissemination of information, circularization of periodicals, etc. Although « complete » reference service is not the same as « dynamic », or « conservative » the same as « passive », there is likely to be a certain amount of correspondence »[6].

After Joan Tighe of Australia had reviewed the new ASLIB curriculum for the education of subject information specialists, she said « ...if all this is an information officer, an information officer is a special librarian »[7].

By this we do not wish to aver that a new profession is not developing or possibly already exists, nor that it has no right of existence, but merely that the emphasis on differences rather than on similarities cause an artificial gap which will be difficult, but just possible — and we hope it can be done in South Africa — to bridge. Not the least of the attempts to effect this compromise, lies in education activities. Jesse Shera expresses this very well when he says: « ...librarianship... is not yet sufficiently mature to have evolved a common generalized discipline which all librarians and information scientists must master before they embark on their respective specializations. The identification of this common body of theory and practice is the peculiar responsibility of library education, working in concert with the practitioners »[8]

If we accept this point of view, it should be clear that the newest developments may lead to specialization and refining of a basic library function, if we do not, then this field of study lies completely outside the scope of the education for librarianship[9].

In order to define all this more specifically so that the librarian's field of study can be demarcated, these fields must be defined separately. I have chosen the terminology as a starting point.

The terminology

Seldom before in the history of library services, has there been a period of such Babelonian confusion as now exists in connection with the terminology concerning information science. The reason for this confusion lies in the uncertainty about the scope of information science. Objectives, functions and criteria await formulation, and until this is done, the Tower of Babel will continue to collapse over the confusion of terms.

In studying the library literature of the last decade or two, we find ourselves entangled inextricably in a network of terminology which hampers communication. The terms *information scientist, information specialist, information officer, documentalist, special librarian, information engineer, subject information specialist* and so forth, are used so haphazardly that little can be made of the documents unless the author has defined the terms or appended a glossary.

In England, for exampe, this worker is usually, but not always, an *information officer*, on the continent of Europe he is a *documentalist* and in the United States an *information scientist*. This confusion in terminology arises mainly from differences in interpretation about the nature of the activities rather than from lack of specific terms. Standardization of terms will be possible only if the functions of the various facets of the subject can be clearly defined. Lack of time does not allow me to deal with this problem more fully. A few general fields in connection with the information problem may, however, be defined.

Regardless of whether the information agency is documentation orientated or information orientated, the following broad fields of activity can be indicated:

1. *Selecting, collecting, arranging, conserving, and retrieving documents and information.*

   In this case we are dealing with the *librarian* and if it is a specific subject field, with the *special librarian*, known in Europe as the *documentalist*. The activities in this connection are called *library science, information science* and *documentation science*, as the case may be.

2. *Selecting, evaluating, interpreting, and presenting information in a specific subject field.*

   In this case the terms *information specialist, subject information specialist* or even *technical literature analyst* are used since this person is an expert concerned with evaluating, interpreting and presenting information for a fellow expert, although he may not always be quite as specialized [10].

3. *Studying the processes and methods, channels and aids concerned with the dissemination of knowledge and information.*

   In this case we have the *information scientist* and the field covered is that of *information science*.

   Incidentally, the demarcation between the work of the librarian in carrying out his information function and that of the information specialist cannot be easily defined. A great deal of study will be required, the results of which will undoubtedly influence education in this field.

4. *The receiving, arranging and referring of enquiries in any organization for the dissemination of knowledge by suitable persons, bodies (such as associations and research institutes) and organizations (such as libraries, especially special libraries, and documentation centres).*

In this case we have an *information officer.*

Naturally the terms as used above are not all-inclusive or all-exclusive. It will be extremely difficult to define them as such, since the various fields overlap. For our purposes, however, these definitions are a starting point. The activities of the whole field is defined as *information science* to differentiate it from *library science* which deals with the organization of documents and information in libraries, and *documentation science* which deals with the organizational methods used for documents.

I mention the following examples to illustrate the confusion:

At the London conference of the FID on 8th September, 1961, the education committee decided to arrange an international symposium « for the exchange of experience in documentation work and education of documentalists ». When the symposium was actually held from 3-7 April, 1967, it took place under the title: *International conference on education for scientific information work.* The actual contents of the symposium was still as envisaged in 1961. In the papers read, terms such as *documentation, information work, information science* were used synonymously. Furthermore, it appeared that members from the continent used the term documentation, the English used *information work, science information work special library and information services* and even *the use of specific subject literature,* the Canadians *used scientific information work* (which surely differs from *science information work*) and the Americans used *information science.* All these terms referred to the same concepts[11].

The 1961 and 1962 conferences of the Georgia Institute of Technology attempted a definition of a number of terms owing to the confusion of speech at that stage.

The *science librarian* was defined as « A librarian with a broad, though not necessarily deep, acquaintance with science, and a comprehensive knowledge of the literature of science. He differs from the literature analyst in two respects: 1. He is a librarian, and therefore qualified to deal with the usual problems associated with the operation of a library. 2. While he can and does perform science literature searches, he cannot in general, critically evaluate the content of the literature. The technical literature analyst interacts with information in books; the librarian interacts with the books ».

The technical literature analyst is: « One who is trained in a substantive technical field, who has, in addition to the depth thus provided, some breadth of technical knowledge and a thorough knowledge of the technical literature. He can analyse the literature for researchers who are investigating problems in the areas of the analyst's technical competence. Analysis implies a search, an organization, an evaluation of the literature; the analyst differs from the conventional science librarian in that he is sufficiently deep in science to be able to make value judgements of its literature. At higher levels this person generally performs not only analysis but synthesis of the literature as well ».

The information sicentist is: « One who studies and develops the science of information storage and retrieval, who is interested in information in and of itself ».

Information they define as: « Knowledge af a factual kind, usually gathered from others or from any of the storage media, and ready for communication or use » and *information science* is defined as: « The science that investigates the properties and behaviour of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. The processes include the origination, dissemination, collecting, organization, storage, retrieval, interpretation, and use of information. The field is derived from or related to mathematics, logic, linguistics, psychology, computer technology, operations research, the graphic arts communications, library science, management and other fields »[12].

The scientific field

In a paper Professor P. C. Coetzee, of the University of Pretoria, emphasized the social function of the library and more specifically of the public library[11]. This point of view balances the scientific and technological approach to the new techniques in information science and constitutes an important contribution to the literature on the subject of the notable absence of this aspect during many national and international conferences and in the literature on the subject.

The paper by Coetzee is of importance, as it helps us as librarians once again to clarify our position in the community. Unfortunately it is a fact that the unknown, the technical almost tangible and the calculable is, in any profession, always more attractive than the less tangible, since the former can more easily show results while the latter is more speculative and vague. It is difficult to determine which one will, in the long run, have the more permanent results. World history, however, clearly proves that it is indeed the intangible heritage which has, through the ages, enabled mankind to enslave the tangible legacies and make them instrumental to his spiritual wellbeing. Because of this, we librarians, who have as a rule been reared against the background of a cultural life, dare not neglect our duty to future generations of librarians by gainsaying them the benefit of our views steeped in the humanities.

For these reasons, we must do justice to our social obligations towards our respective communities and nations. This can be achieved by educating librarians against a suitable cultural and social background. So we must not fail to train present and future librarians in the broad culturally formative atmosphere of previous generations of librarians.

There are two courses open to us: *First* to ensure that the librarian acquires the necessary cultural background during his professional training, through his studies in the field of human sciences. This will enable him to discharge the social functions of all types of libraries and to provide for the furtherance of these functions by means of professional training. *Secondly* to enable the student and the tutor to investigate the problematics of the social functions of the library, by creating opportunities for research. Also in this connection the time is past for individuals to attempt fields of study on their own. Team-research, which includes librarians, sociologists, psychologists, etc., remains the obvious way to investigate future cultural-sociological problems included in the newer methodology, as well as the information function.

If we once again consider the definition of the word *information science*, then it is clear that here we are concerned with an interdisciplinary « discipline » — placed within quotation marks because it has not yet been proven that we are dealing with a new discipline — and that this field offers ideal opportunities for research. The results of this research, from which principles and theories could be crystalized, are precisely the elements which can be implicated in the education of librarians, documentalists or information specialists. Because this new « discipline » or field of study is by nature interdisciplinary, it is clear that subject-experts from the human and social science fields as well as the physical sciences will have to act as research teams, if an encyclopedic consideraton of this subject is to be attempted. This does not exclude research projects in specific fields. The librarian, the psychologist, the mathematician, the statistician, the engineer, the philosopher and many others should study these phenomena in their own specific subject fields. Final conclusions will be possible only after integrated correlation has been achieved.

The question may well be put at this stage as to what the actual difference between communication science and information science is. Is it not possible that these two fields — if they actually are two distinct fields — are interrelated to such a degree, that we are concerned here with only one field of research? I can only believe that these two fields will eventually be so closely associated, that we may and can treat them as one and the same field.

While the field of information of e.g. the physicist and technologist can be clearly and precisely defined it causes us to reflect on the fundamental meaning of library science. If it is true that library science has thus far developed philosophically and empirically, without a scientific basis and that the results of information research give the librarian the nucleus for a scientific basis, but the problems of the library profession are passed on by librarians to other researchers, then we are giving with one hand and taking with the other, for how can the scientific basis of the library profession be relinquished to other researchers without acknowledging one's own incompetence. The provision of information has, in my opinion, always been one of the scientific bases of library science, but one on which librarians were unable to do thorough research through a lack of means. Attempts have been made, but they have mainly been based on the research methods used in the humanities. Since the physicist and the technologist have refined their research methods, we must advance with them and seek for answers and solutions in their fields as well, without neglecting the social and human sciences fields. And this is where the danger lies in the long run, namely that the physicist will try to monopolise a new field and that the humanities will consequently be neglected.

In our search for the science of librarianship, efforts have been made to carry the search back to the *book* and the *library* as social phenomena. But did librarianship hinge upon this or was the crux of the matter the *thought* expressed in the book? if it hinged on the thought and the object of library philosophy was this thought, then the question arose as to whether there was any difference between philosophy and library sicence. If, however, we are concerned with the transmission of the thought, then it would appear as if we were moving closer to the discovery of a central object from which a central science and the resulting practice would flow which constitutes the scientific foundation of library science.

The other matter which is very closely connected with this and which we must reflect upon before proceeding toards a proposed demarcation of the fields, as suggested in previously quoted definitions, is of a much more practical nature, viz. the establishment of information centres, which forms the nucleus of the Weinberg report.

In order not to delay the eventual completion of the cycle of scientific fields, librarians may not and should not ignore the establishment of similar centres. In my opinion the conclusions reached by the Weinberg report sprang from the demands of our circumstances — a way had to be found to rush to the aid of the natural scientist before he became constricted in the influx of information, so that he could obtain information speedily in accordance with the demands of our times — and from the failure of the librarian to provide through traditional means the natural scientist's needs as seen in the light of his dilemma resulting from the information explosion. These information centres of the Weinberg report exist around the subject specialist and the information-directed, as opposed to the document-directed subject specialist who has to assist him in the search for information. For this, is necessary: the selection of stored information retrieval, evaluation and interpretation of the information and presentation in a form usable by the subject specialist. In reviewing the demarcation of fields by means of terminology we see the subject specialist here using the refined information techniques which to a great extent librarians have long since been using, with the exception of the evaluation, interpretation and presentation of information.

At this stage we may ask whether towards the end of this century the human scientist will not find himself in a similar predicament as the natural scientist today. Should this happen — and to a large extent it already does happen — the same path will, after all, have to be followed as that which we are advocating at present for the natural scientist through the establishment of information centres. The same techniques and methods will be applicable, with some adjustments according to the circumstances. For this reason, the new discipline may not be regarded as the sole property of the natural scientist and technologist.

In this context the question arises whether the user-directed service of the information centre and the thorough study of its methods, needs and the nature of its enquiries, do not cover the same — or partly the same — field as that studies in readership. I think so, but far more research and reflection are needed to arrive at a more exact conclusion.

Fields of study

From what has been said so far, the following fields of study can be crystalized.

1. *Documents*

   This field concerns selection, acquisition, organizing, storage and retrieval of documents.

2. *Information*

   In this case we are concerned firstly with the selection, acquisition, organization and storage of information and secondly, with the retrieval, selection, evaluation, interpretation and presentation of the information.

3. *Information discipline*

In this case we are interested in the methods of obtaining, flow, conveying, and use of information.

4. *Management and organization*

This is an aspect of information science that has as yet been almost untouched. At the beginning of this century and particularly in recent years we experienced swift development of management and organization methods and techniques which have already influenced the conventional library. The use of new techniques and methods and the needs of information require a re-analysis of management and organization of the new services. Without discussing this aspect in full detail now, it will suffice to state that the study and application of scientific management methods to library and information services justifies thorough research and attention.

Closely related to this last aspect lies the practice of systems design and analysis that effectively relate people and machines for the control and dissemination of specialised knowledge[15]. That is the way R. S. Taylor, formerly of Lehigh University, regards the systems analyst. In my opinion the systems analyst's task is much wider and his work includes the analysis and design of all methods and techniques of rendering service. Therefore, the task of the systems analyst should be studied in this fourth field.

A demarcation of study fields as given above was necessary to investigate the implications for professional education, as, in order to arrive at the formulation of educational requirements in any profession, it is necessary to define exactly the whole extent of the subject field and the practice originating from it. Education in any profession has always, through the centuries, been a result of professional practice. The medical, law and educational professions are but a few of the many examples that can be quoted to prove this fact. In this respect librarianship is certainly no exception. We saw this happening with the fields of special librarianship and documentation — both have developed out of traditional librarianship — and today these are presented together with, and often as part of a course in library science.

Education needs

However, there are also the practical demands and needs of a country to be taken into account before we are able to proceed with the formulation of the contents of a programme of education. This was recently undertaken in England on an intensive scale. Here I refer to the survey made by Schur and Saunders[16], who emphasized two aspects beyond all others. Firstly, the danger of an over-supply of librarians and secondly, the necessity of co-ordination in education methods, facilities and amenities [17].

In the U.S.A. the Weinberg Report stimulated the establishment of information centres which in turn considerably augmented the demand for personnel. In contrast to England, this resulted in a demand for education facilities with a view to meeting the shortage in personnel. Various universities reacted immediately. The Georgia Institute of Technology in Atlanta (Georgia) devoted attention to the matter by means of a grant from the National Science Foundation. From this emanated the conferences of 1961 and 1962 on the education of subject-information specialists[18], followed by the opening of the School of Information Science there in 1963 [19]. Lehigh University, under the direction of Robert S. Taylor, held a series of seminars which was to be expanded on an inter-disciplinary basis; the American Institute of Biological Sciences launched a co-operative programme involving a number of universities in the Washington area to offer courses in science information administration at masters' and doctors degree level; the Drexel Institute of Technology initiated a masters' degree programme besides the existing programme for the training of librarians which calls for at least a bachelor's degree in the natural sciences or technology as a requirement for admission. The Case-Western Reserve University under the direction of J. Shera also devoted its attention to the matter.

Some years ago in South Africa the Council for Scientific and Industrial Research was requested by the South African Library Association to conduct a survey on the needs of subject information specialists, the number of posts available and the possibilities for expansion and promotion. From this was to follow the possible institution of courses which would satisfy those needs. Although hardly anything came of the survey itself, it was subsequently recommended that short courses in information science be considered. However, further research is still being undertaken and the University of Pretoria has only very recently introduced a new subject, viz. Information Science (extending over three years) which has to be taken in conjunction with Library Science (extending over four years), for the Bachelor's Degree in Library Science.

Possibilities for education

While we are as yet not aware of what South Africa can offer by way of trained tutors in the field of information science, it may perhaps be premature to recommend and institute separate course. On the other hand it would be reasonable to assume that in view of needs encountered overseas, South Africa could within the not too distant future — and already certain signs are apparent — experience a considerable need for a differently trained information worker.

Therefore, if we are not to be caught unprepared, we should even now consider certain possible courses to be pursued in order to obviate this.

Firstly, I suggest that education should be directed towards service on the one hand and research on the other.

By service-directed education is meant education directed at the needs experienced in practice. In this respect there is in the first instance the need for education tuned to the social function. Current education at our universities, meets this requirement to a considerable extent, although this function is still being directed over duly to the public library alone. Whether in fact it is possible to put into practice this type of orientation and to what extent it may be implemented, is a matter which requires thorough investigation. Yet, it would seem feasible.

A second aspect of service-directed training concerns the information function — a function which all libraries perform. Therefore education directed towards the information function should take this into account. In practice this type of education is of more value to industrial, university and other special libraries.

It therefore amounts to this: education can be presented in two ways, viz. the social-culturally directed and the information directed. Neither precludes the other, but emphasis will determine the direction. This implies that a core content for education which is to be applicable to both those directions would have to be compiled, but that directed education would be made possible.

This possibility requires our serious attention since it is a practical impossibility to present directed education for *all types of libraries* particularly in view of a shortage of students and lecturers in South Africa.

Since in practice the need for subject information specialists in all probability does not at present justify a separate course in this country, such persons would be obliged to follow the usual course if they are to receive any training at all.

In any case, I consider that matters such as the following should be included in the curriculum of a course relating to the information function:

1. Information sources and services.
2. Access to and retrieval of documents and information, which includes subject analysis and indexing by means of conventional and non-conventional methods.
3. The sociology, psychology and needs of the users of libraries.
4. Research methods and techniques.
5. Abstracting and annotation methods and services.
6. Mechanization and automation.

7. Reprography.
8. Publishing methods, techniques, and channels including drafting and writing reports, etc.
9. Selection and acquisition of documents and information.
10. Business methods and techniques of management and organization with regard to materials and services.

Since time does not allow consideration of all possible combination we shall merely indicate that courses should be offered on a unit basis while leaving a measure of choice to the student.

In this way provision will be made for the education of librarians of socially-directed and scientifically-directed libraries and the present need for subject information specialists will, to a great extent, be met.

Incidentally, I do not believe that training information officers serves any purpose at this stage and neither is it within our province, although a course as indicated above might be of some value to them.

This service-directed education should be presented at two levels: firstly at a lower professional level and secondly at a higher professional level, as is the case in South Africa. The lower professional level should be much more technique-orientated and may independently supply technicians for socially-directed and scientifically-directed libraries. There is considerable interst in this training in the U.S.A. and courses are already being offered by the *Graduate School* of the Department of Agriculture and by several other institutions, while the Library Education Division of the American Library Association has compiled criteria for such training.

In the second place *service-directed* education should be conducted at post-graduate level leading to a second degree. The duration of the course should be two years and the requirement for admittance at least a three year bachelor's degree. The type of bachelor degree the student already possesses, will in a large measure determine the field of study to be chosen for the degree. This course will supersede the present four year course for a B. degree in Library Science. So much for service-directed education.

On the other hand let us consider *research-directed* education which will particularly benefit information science, although research in respect of the social-cultural function will have to continue. Taking the South African situation the duration of such training will be at least one year and among other things a paper on a topic of research will be required. The study will then lead to a master's degree. Candidates who are in possession of the present honours degrees will be admitted to the master's studies. Further study leading to a doctor's degree must be retained as in the past.

As in the case of the subject information specialist, attention cannot at this stage be given to training of system analysts and information scientists, although in the latter case facilities for research at master's and doctor's levels must be planned.

For this purpose a scheme such as that of Weaver[22] and of Jones[23] may be considered, by which basic problems may be investigated on the *technical*, *semantic* and *pragmatic* levels. The first-mentioned level concerns « the fidelity of information transmission and analysis » which involves information theory and cybernetics as designed by electrical engineers and psychologists; the *semantic level* « is concerned with the production and understanding of meaningful communications » as expounded by linguists and psycho-linguists in their theories about spoken language, writing and reading, meaning learning of language and thought; the *pragmatic level* « deals with the problems of the effects of communication » as investigated by socio-psychologists and sociologists, involving subjects such as communication and persuasion, mass communication, influence of media, and problems of science as an information exchange system.

Apart from basic orientation with regard to management and organization in service-directed education, a need for advanced education in this field already exists in South Africa. At present there are two possibilities in this respect. One is to present symposia for librarians and management scientists, and the other is for librarians to attend post-graduate courses similar to business leadership courses offered by the Universities of Chicago and South Africa. Such symposia and post-graduate courses are intended for experienced senior officers who are permanently employed.

Further investigation

The time has come for the library profession in South Africa to reflect earnestly on the form of education to be offered during the next decade or two. It is clear that we are at the cross-roads, particularly as regards basic education for librarians, education of librarians for scientifically-directed libraries, education of information scientists, subject information specialists, system analysts, provision of research facilities, and a re-orientation with regard to designation of courses and levels of education. In South Africa serious attention is at present being given to the matter and a symposium is being planned for 1973 by the University of South Africa in collaboration with the South African Library Association, to which internationally known persons will be invited.

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THE TRAINING OF DOCUMENTALISTS WITH A VIEW TO THE NEEDS OF DOCUMENTATION CENTRES AND SPECIALIZED LIBRARIES IN TUNISIA

by
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The paper presents a general survey of documentation training in Tunisia: covering contacts established at national and international level, and the results of ten years teaching given by the Ali Bach Hamba Institute. Based on two simultaneous enquiries carried out among documentalists, the managers and users of documentation centres, certain figures and statistical information on the current situation of this profession in Tunisia are given (level of general training, efficiency of services provided in relation to expressed needs, relations between documentalists and users, etc.). It is considered that Tunisia now needs to support its present medium level cadres trained in documentary techniques with a body of higher level documentalists in order to give the profession a proper status in the country and to create a network of national information resources capable of being integrated eventually in an international information resource.

The problem of the training of documentalists in Tunisia was raised for the first time in December 1964, during the « Journées d'Etude sur la Documentation », organized by the Ali Bach Hamba Institute.

In fact, among other conclusions reached at this meeting — which was attended by high authorities of the Tunisian Administration, numerous high-level executives in the public sector, experts of International Organizations and representatives of various firms — there was a unanimous statement on the lack of skilled personnel in this field, and the persistent difficulties of recruiting and training them.

Stemming therefrom, one of the conclusions reached by all the participants was that training be organized for documentalists through courses, further training courses and seminars, and the possibility be studied of organizing refresher courses at the Ali Bach Hamba Institute for serving documentalists.

A liaison committee between documentalists and documentation centres, the setting up of which had also been recommended, was then charged with working out — together with the Ali Bach Hamba Institute — a programme of courses for the training of documentalists.

Thus, assisted on the one hand by this Committee and on the other hand by the Friedrich Naumann Foundation of Bad Godesberg, the Ali Bach Hamba Institute was able to hold its first documentation course in October 1965. This accelerated course, lasting only six-seven months, was organized in particular for Tunisian intermediate executives, seconded by their respective department or company.

In 1966, a new recommendation was made. This concerned the « development of the teaching of documentation at all levels », and was formulated at a symposium arranged by the ABH Institute on the subject of « young countries facing the problems of documentation ».

Again in 1966, there was a third recommendation regarding « the training of documentalists and higher documentation executives and their specialization in Social Sciences ». This recommendation was reached at the end of a Maghreb Conference arranged jointly by the ABH Institute and CERES, entitled « Research and documentation in Social Sciences ».

Finally, in 1968, the participants at an international conference arranged by the AHB Institute recommended:

1. That the profession for documentalists, librarians and archivists be recognized and organized by the promulgation of a Statute in line with regulations in all other countries.
2. That the following be assured:
   - — at a national level, the training of operative personnel
   - — at a regional level, the joint training of executives (archivists, librarians, bibliographers documentalists) by the setting up, possibly based on existing institutions, of regional schools, one for Maghreb and one for English-speaking Black Africa.

In Tunisia, instruction in documentation had led in six years to the training at the ABH Institute of seventy-one Tunisians — mainly intermediate-level executives - three Europeans, ten Maghrebi (eight Moroccans and two Algerians) and twelve Africans from Dahomey, Cameroun, Togo, Congo, Senegal and Upper Volta.

The promotion of training in Tunisia, from the level point-of-view, advocated in the recommendations just quoted, has not been able to take place due to the difficulties encountered in attracting the higher executive class to this profession, which is still but little or badly known by certain people, and especially not officially by a Statute.

An investigation very recently conducted by one of the ABH Institute's documentalists shows that of the seventy-one Tunisians trained, only forty-one still continue their profession. We made inquiries to find out what had become of the thirty others, and learned that some had become discouraged because they were mistakenly used by their employers and had left the profession completely. Others had taken better paid jobs in other sectors, while yet others had realized they did not have the necessary vocation to succeed in this line.

We consider it interesting to let you know certain observations stemming from investigations carried out with serving documentalists, regarding their present activities.

Generally, the training received at Bach Hamba has indelibly marked them because they all use a documentary base which is more or less considerable according to the classical techniques they have learnt: traditional card-index with different entries: authors, subjects, geographical localities, hierarchical classifications and sometimes titles. Ninety per cent apply French AFNOR cataloguing rules. International or national classifications such as UDC, INSEE, the OECD classification or that of the Sciences Politiques de Paris, have been adopted by forty per cent of the documentalists; a further forty per cent have made a thesaurus with the help of researchers or colleagues from their Centre. In some cases, they use both a classification and a thesaurus. Ninety per cent make bibliographies, most of the time on their own initiative, which it is important to emphasize. Thirty per cent carry out Arabic-French or English-French translations.

In order to anticipate the needs of their users, sixty per cent publish information bulletins or analytical bulletins. Lists of acquisitions are likewise regularly distributed and interesting articles are pointed out to those responsible.

It should be noted, finally, that every one of them has at least an offset, Xerox, etc., machine available, and can therefore easily distribute information by means of printoffs, at least within his own organization.

The difficulties they encounter largely concern orders for works or periodicals (collection difficulties, payment difficulties due to the fact that they do not yet utilize the UNESCO coupon system).

Lastly, they all consider they should be permanently recycled in order to answer up better to the varied needs of their users, whose needs are evolving ceaselessly, and for there to be a close dialogue and co-operation between them. This co-operation would undoubtedly be better — this is unanimously acknowledged — if the users themselves were initiated into documentary techniques.

While internal co-operation appears satisfactory, external co-operation is unfortunately less so, at both national and international levels for a mere thirty per cent of the documentalists have established any exchange service with other Tunisian or foreign centres.

In the light of these few observations, we can deduce that serving Tunisian documentalists are optimistic about their profession and about the way they fulfil their tasks. But, what do they amount to compared with the needs of the country's specialized documentation and library centres? Is their optimism shared by their employer? Are they really used in the best way?

We would greatly like to know the view of those responsible, and to compare the user/documentalist point-of-view.

In fact, a first attempt to inventory Tunisian documentation units was made in 1967 by the Documentation Section of the AHB Institute. This meant making an inventory of the centres, services or offices performing documentation tasks, considered in their widest acceptation and according to different branches of activity. Eighty-three « units » were pinpointed, although they were manly document stores or libraries rather than real documentation centres.

It therefore appeared interesting to repeat this inventory, bearing in mind the experience gained and the undeniable evolution of some of these units, meanwhile reinforced by qualified, diploma-holding staff.

To do so, two questionnaires were prepared by the AHB, one for firms and centres already having a documentation service or centre, the other for those still without one. We made a special point of insisting that these forms be filled in by those actually responsible - Chairmen, General Managers or Managers - so as to know their feeling about the subject and to define precisely what they expected of documentalists, and lastly to locate their real needs in this field.

We should like to refer to the few conclusions we have reached after screening these questionnaires.

(We should point out that these are the results of the questionnaires sent to the firms already having a documentation service or centre. We are unable to talk about the others, given the minute number of answers we have received. This should not cause undue surprise, for those responsible for firms not possessing their own documentation service cannot be fully aware of the problem and lack a motive).

To come back to the firms having a documentation service, we noted in the first place that these services all come under a General Management or another Management, with few exceptions, and this is a very positive factor, confirming as it does that those responsible are conscious of documentation.

Second, these services provide permanent training, but only fifty per cent of them are useful for decision making. Only twenty per cent of those responsible state their satisfaction with the services, while the remaining eighty per cent complain of the insufficient nature of the documentary base for budgetary reasons or difficulties of collection, or again because of staff inadequacy; numbers range from one to nine according to the importance of the service.

Of the executive personnel, fifty per cent are graduates but without any training in documentation, thirty-five per cent have passed university-entrance examinations — of whom three have diplomas from Bach Hamba —, and fifteen per cent are of university entrance (« baccalaureat ») level, including two who were trained at Bach Hamba.

Among the operative personnel, fifteen per cent have their baccalaureat against eight-five per cent of university-entrance level. Only two documentalists were not trained at Bach Hamba.

These few figures show clearly that personnel with documentary training do not form the majority in firms. However, the views expressed by the majority of employers on their documentalists or those acting as such are favourable even in cases where they are not satisfied with their documentation unit.

General higher training is thus favoured by those responsible, except for thirty per cent of them who complain, despite everything, of the lack of knowledge in the sector and of documentary techniques, also deploring the bad circulation of information, and a total ignorance of outside information.

Consequently, fifty per cent aim in future to recruit personnel having an all-round training, as suggested by our questionnaire, i.e. « Baccalaureat » plus two/three years of legal, economic and scientific training, with a clear pre-dominance of one of these plus documentary techniques. Forty per cent opted for baccalaureat holders plus documentary techniques, and ten per cent for graduates plus.

Moreover, those responsible are prepared to give a training grant to their employees: fifty per cent are in favour of training in Tunisia for one year, thirty per cent would like this training to take place abroad, and twenty per cent refuse to give a grant.

Finally they raise no objection to their documentation service forming part of an information network and are in favour of such being set up in Tunisia.

These few results induce us to say that the training of intermediate level documentalists by the AHB has not been useless since it has permitted the start and the launching of a service whose existence and utility are no longer contested.

Thanks to these serving documentalists, a fair number of those responsible have become aware of their documentation requirements and of the need to organize and exploit their documentary base in order to achieve better management of their firm or centre.

With this awareness accomplished, there is another and more important barrier to cross, viz to make these documentation services even more efficient and profitable, by deploying efforts so as to install real co-operation among services of the same discipline, so that co-ordination of tasks may be carefully thought out and planned, these being the basic conditions for establishing a solid documentation infrastructure. In this context, we would stress that praiseworthy efforts have been made in this direction, in Tunisia, in the field of agriculture.

But such results can be obtained only if a new generation of higher executives trained in documentary techniques reinforces the present team of intermediate executives.

The all-round training mentioned would permit them to assimilate very rapidly the jargon of the sector of their firm, to answer up to the requirements of those responsible; interpreting these needs or even creating new ones, useful to promote the firm and stimulating and motivating the operative personnel, with a view to such promotion. These new working conditions would certainly have repercussions in the use of the service which could then serve one hundred per cent in decision making.

On the other hand, a body of higher documentalists would probably wield greater weight in obtaining official recognition of the profession from the Authorities. The existence of a statute would provide an undeniable stimulus, on both executives and operatives.

Lastly, at a time when more and more is being spoken about integration in international information networks, the interests of which need no longer be stressed, it is best to take advantage of the disposition shown by those responsible and to recommend the creation of a national information network, to which the experts on the subject, whom we have had and will be having the pleasure of listening to at this conference, will not fail to give — this we do not doubt — all the useful, practical advice necessary to achieve this.

I hope that this scanty information will serve to provide a picture of training in Tunisia, and to clarify certain points which might otherwise still be somewhat obscure, especially for non-Tunisians.

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TRAINING IN INFORMATICS: INADEQUATE SOLUTIONS AND AN OPEN DOOR TO SPECULATION

by
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In Italy, as elsewhere, the major problem of training personnel in informatics is still unsolved. An estimate is given of the country's probable manpower requirements for the next five years and the education requirements to meet the demand are surveyed. The need to introduce elements of informatics in higher secondary schools is recognized and reference made to the successful experimental courses given at technical institutes under the aegis of the Ministry of Education based on the concept that EDP specialists should already be qualified in another field (so as to obtain experts orientated towards particular applications (accountancy, chemistry, etc.). The organization of such programmes on the vast scale needed is hindered by lack of qualified teachers and the problems of equipment and the selection and creation of teaching material. Present university level teaching is inadequate and tends to be too abstract inspite of the creation of some university institutes in informatics. Their success has been considerable but limited in scale especially due to shortage of competent teaching staff. Hence present educational initiatives are incapable of producing adequately trained personnel in informatics in sufficient time to meet pressing market requirements. The consequences are a constant rise in cost of specialists irrespective of quality, a brake on computer use and proliferation of initiatives speculating on the difficult labour market and attractive job prospects in EDP. The strict control and suppression of these speculative institutes and immediate steps to provide training even in the private sector (under the control of the educational authorities, professional associations and manufacturers) are called for.

Three generations of computers have passed, methods of managing data processing centres have changed, programming techniques have evolved, hardware has yielded in importance to software, and while many problems in the field of informatics have been solved in consequence, we have not yet succeeded in solving the great problem of the training and recycling of personnel to be employed in this sector. Public and private agencies and large associations have dealt with it; suffice it to recall the report of the AICA study committee in October 1969 on the « Preparation of personnel for electronic data processing in Italy », or the report of researchers Giargia and De Maio for the Turati Club on « Electronic computers in Italy ».

Editorials on this subject have not been lacking in foreign and Italian specialized journals such as *Notizie rapide* (Rapid Information), *Automazione e strumentazione* (Automation and Instrumentation), *Sistemi e automazione* (Systems and Automation) and *Centri meccanografici ed elettronici* (Computer and Electronic Centres).

Every time the cries of alarm are repeated about the scarcity of technicians. This, it is stated, will have a substantial effect on the spread of electronic computers which, compared with other European countries, should be far greater in Italy than it actually is.

In the next five years, according to the study by Giargia and De Maio, the following numbers should be trained and supplied to the labour market:

7,000	centre supervisors
9,000	analysts
21,000	programmers
17,000	operators.

This adds up to a total of 54,000 persons, in addition to which there will be a considerable number of hardware technicians with maintenance tasks, etc.

« This is a major commitment to meet, in which it should be possible to count on the combined efforts of the universities, the secondary schools, the manufacturers and private schools ».

In personnel preparation, it should be borne in mind that besides the quantitative aspects, the qualitative aspects of the problem are bound to acquire increasing importance. The technicians who will be required, especially analysts and specialists in operative systems and languages, must not only be numerous but also good, to permit the increasing and fuller use of the enormous possibilities for processing and computing today offered, but only forty percent utilized, by modern computers.

AICA has outlined solutions aimed in particular at the various levels of our school system.

Starting with the assumption that « a university training is necessary for analysts and a secondary training for programmers », it is suggested that the programmes of study in the upper secondary schools be adjusted in the light of two objectives:

1. information on automatic calculation
2. formation of specialists.

To achieve the first objective, the introduction of new notions into traditional subjects such as mathematics has been suggested. Such new notions are:

- the concept of algorithm
- the use of flowcharts in description of algorithms
- overall description of a computer
- the concept of program language.

In the preparation of specialists, on the other hand, the validity of the criteria followed experimentally by the Ministry of Education in courses of observation started in a number of commercial and industrial technical institutes has been borne out. In these courses the basic concept is that the EDP specialist should be someone already professionally qualified, so as to obtain EDP experts oriented toward accountancy problems, EDP experts oriented toward chemical application, EDO experts oriented toward technical applications, etc.

The programmes aim at:

— providing not only a general training, but also at achieving effective operative capacities (knowledge of machines, use of at least two languages), and

— linking up with other subjects and an orientation toward the interests of the basic specialization.

The carrying out of such programmes on a vast scale is however hindered by problems that are hard to solve. First, the shortage of teachers which, in the sector considered, appears particularly serious. In general, recourse so far has been had to specialists from the manufacturers and to the very small number of qualified teachers — which number should increase due to the recent initiative promoted by the Ministry of Education for the recycling of a group of teachers with the collaboration of manufacturers.

Another problem is that of the equipment to be adopted. This has been partly solved with the use of machine-time in university computer centres, or with practice at manufacturers' centres.

The last problem is the selection or creation of the teaching material to be used. Even though a group of teachers has been commissioned by the Ministry of Education to finalize texts for the new programmes, the evolution of management software and data processing techniques calls for permanent study groups which can hardly be set up in a governmental context.

Regarding university-level initiatives, the considerations of French experts on what has been attempted in France can be applicable: « The extent of requirements », they tell us, « the attraction of novelty, have brought forth a myriad of initiatives in both the private sector and the universities ».

Quite satisfied, the State has given free rein, and has permitted the creation of new teaching subjects; but the urgency of the problem and its very size now necessitate the making of specific choices prior to going on to measures of a general character. Account must be taken in particular of the increasing complexity of electronic data processing instruments.

Present university initiatives include subjects that are too abstract and risk training persons certain to be left unemployed because they are unprepared for the concrete problems of present-day industry. This shows the lack of imagination of the French universities, their ignorance of the real world, even when they try to rejuvenate it.

Informatics is the daughter of mathematics; and so it has been entrusted to mathematicians, who have often directed their less brilliant pupils to its study. Since computers are used in laboratories, especially for scientific calculations, this type of application in particular has been taught.

The informatics programme of the university institutes of technology, on the other hand, does take account of these aspects. Indeed it was formulated by a commission formed of university experts and specialists in the sector. It covers several disciplines and includes not only informatics properly so termed, but also mathematics, economics and languages, while an eight-week course in the industries completes the years of study. Success has been considerable. Nevertheless, far less than necessary has been achieved by these institutes, especially because of the enormous difficulty of finding competent teachers.

As may be seen, the initiatives illustrated have the defect of not solving the problem of training personnel for informatics in sufficient time, with means and criteria adequate to the pressing market requirements.

The consequences are:

a. constant rise in cost of specialists

b. a brake on the normal development of computer use

c. proliferation of initiatives that speculate on the difficulties of the labour market in general, and on the attractive prospects of a job in the data processing sector.

Since there are no qualified schools to supply sufficiently well-trained staff for immediate employment in processing centres, companies vie with each other for that which exists by making offers and counter-offers.

It is impossible to speak seriously today of salary levels adequate to the informatics specialist's job, because the rule is that of demand and supply. The salaries quoted mean little or nothing; aptitude for aptitude, there exist variations of fifty and one hundred percent on the base levels.

There have been instances abroad of the density of computers being proportionately greater than in Italy, in which companies have had to cancel computers on order because staff could not be found, not even by vastly overpaying.

Such a situation could not fail to cause the fantasy of speculators to get to work, ever with an eye on opportunities stemming from the mistakes or the inertia of the honest.

It is not possible for anyone to fail to observe the invasion of advertising in the press, in the passages of the underground railways stations, on highway hoardings, in leaflets and in the cinema.

This advertising is presented to all and sundry without distinction, young and old, men and women alike, the goose that lays the golden egg of the seventies, the golden profession symbolized by the « fabulous computer » which acts as a blinding-glass for the unwary. There is a proliferation of pseudo-institutes vying with one another in the newspapers for first place in the « situations vacant » columns, to promise those who enrol in their courses a guaranteed job with excellent pay. The unemployed who daily study the columns of the papers in search of a solution to their work problem are attracted by these prospects and invest their savings, trusting in the promises made to them.

Unfortunately these pseudo-institutes take no account whatsoever of the indispensable prerequisites to gain access to programming or analysis activity: aptitude, age and educational certificates. It is clear that in this way, even if a person is given serious instruction, he will not find anyone prepared to take him on at the end of his course.

But unfortunately even course content is frequently defective: gaps in the syllabus, incapable teachers, inadequate teaching material.

We are up against fabricators of illusions, who have taken the place of what the State, the manufacturers, public and private agencies should seriously have supplied.

If we denounce this speculation it is in order that countermeasures be taken with direct and indirect means: punishing those responsible, setting up control commissions, hastening to solve the problem of personnel training, if necessary with private initiatives which can have the advantage of rapidity and timeliness, but under the protection of and endorsed by agencies and associations recognized by the Ministry of Education and by the manufacturers.

DR. LUCIANO MEDICI, born in 1930, took his degree in philosophy and diploma in psychology in 1954, specializing in the problems of the selection and training of personnel in the EDP sector. He has carried out his activities mainly with the Olivetti S.p.A., General Electric Information Systems and Siemens Data companies.

ANALYSIS OF THE DUTIES OF A DOCUMENTALIST

by
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This paper presents a partial sketch of a report being prepared by the French Working Group on the task of documentalists as the basis for an investigation on the state of documentation in France and the documentalist's working conditions and professional status, in order identity actions necessary to upgrade the profession and provide a dynamic policy of training and recycling for serving documentalists. The categories of documentalists are listed in very great detail.

The working Group for the analysis of the documentalist's tasks composed of fifteen persons, has met on several occasions over the past year, within the framework of the Commission on Professional Problems. In this first year it undertook the task of reflection, and proposes to analyse and describe all the tasks that documentation professionals might have to perform, in obviously different ways according to each one's working context.

This analysis is not yet completed, and the present document is but a partial sketch of the report which the group envisages. Its members hope eventually to block out a detailed « profile » of a documentalist, since the possession of this appears necessary to them to form the basis of several urgent actions: an investigation that should lead to a precise knowledge of the situation of documentation in France and documentalists' working conditions; a comparison of the professional statutes that exist at present, and an effort to improve these statutes, to upgrade the profession and to rectify the image of it held by the general public and employers; applying a dynamic policy of professional (vocational) training and recycling documentalists already in service.

For ease of description, the tasks have been grouped under the following headings:

1. Study of needs of the documentation unit.
2. Source research.
3. Selection of documents.

4. Document acquisition.
5. Material processing of documents.
6. Intellectual processing of documents.
7. Storage of data.
8. Communication of documents.
9. Communication of information.
10. External relations.
11. Administrative and financial management.

It seemed necessary to indicate at the same time the minimum level of competence required to perform each task.

To this end, four categories of collaborators in a documentation service have been distinguished.

Category D covers the executing employees, having an essentially practical training.

Category C includes assistant documentalists who have a general education of average level and a technical qualification.

Category B includes qualified documentalists who possess a specialized education (acquired through higher studies or practice) and a high-level technical training.

Category A differs from the preceding by a functional criterion, not one of competence. It includes documentalists who are qualified and also have responsibility for their service, and who are by this token able to reach decisions beyond the purely technical level. Apart from these « policy » type decisions, the qualities needed for those in Categories A and B tend to overlap, especially in small units.

* * *

	A	B	C	D
1. *Study of needs of the documentation unit*				
1. Examine potential and actual users		B		
2. Analyse their needs (meetings, surveys, interviews)		B		
3. Map out the documentary field	A			
4. Decide priorities	A			
5. Make an inventory of the existing documentation base and determine gaps		B		
6. Establish an organization or reorganization project for the service (budget, payroll, installation, programme)	A			

	A	B	C	D
2. *Source research*				
1. Gain information on sector of activity		B		
2. Consult works of reference: yearbooks, catalogues of periodicals, bibliographies, etc.		B		
3. Contact information and documentation bodies in the same sector		B		
4. Consult specialists in the business and outside specialists, with universities, schools, training institutes, etc.	A &	B		
3. *Selection of documents*				
1. Compare needs and sources		B		
2. Determine criteria of acquisition and elimination and constantly adapt them to evolution of needs		B		
3. Locate documents it is not necessary to acquire but whose existence it is necessary to know about		B		
4. Decide upon acquisitions		B		
4. *Document acquisition*				
1. Complete or verify document identification and address			C	
2. Order the document (choice of procedures and execution)		B		
3. Follow the order, claim				D
4. Receive				D
5. Check conformity of consignment and order			C	
6. Pay or agree to pay		B		
5. *Material processing of documents*				
1. Register documents upon arrival (in register, cardex, etc.)			C	
2. Decide their manner and duration of retention (original form or microreproduction, binding or not, extraction of cutting, etc.)		B		

	A	B	C	D
3. Order and check		B or C		
and/or perform necessary operations for this retention: — reproduce (directly or by reduction) — repair or consolidate — bind — cut (newspapers, etc.) — assemble (files, dossiers, etc.)				D
4. Stamp, label, etc., each document				D
5. Assign code to each document		B		
6. Enter this code in appropriate places				D
7. Arrange and periodically check arrangement of documents				D
8. Make checks and inventories		B		
9. Decide destination of documents of limited retention duration		B		
10. Eliminate them according to decisions reached			C	
6. *Intellectual processing of documents*				
A. *Adoption of processing system using informatics or not*				
1. Adopt a manual or automated processing system	A			
2. Manual systems: choose and organize the different card-indexes (authors, subjects, etc.)		B		
3. Automated system: collaborate with informatics expert in defining programs (sequence of operations - form of notices, etc.)	A & B			
B. *Choice or construction of documentary language*				
1. Research and examination of various existing documentary languages (classifications or thesaurus)		B		
2. Choose a doc. language according to				

	A	B	C	D
— the documentary subject to be dealt with and the processing system chosen	A & B			
3. Possibly construct a documentary language		B		
4. Keep it up to date		B		
C. *Cataloguing, analysis and indexing*				
1. Prepare the bibliographic reference of the document		B & C		
2. Analyse or summarize the document		B		
3. Extract the different concepts and translate them into the documentary language chosen		B		
7. *Storage of data*				
1. Transfer the information produced by processing documents onto supports (cards, schedules, etc.)		B or C		
2. Possibly reproduce these cards, check the copies			C	
3. Classify the cards (in a manual system)			C	
4. Check the card index		B		
5. Participate in control of work of punch card operators and technicians (in an automated system)		B		
8. *Communication of documents*				
1. Fix conditions and methods of communication for each category and sub-category of documents		B		
2. Choose the necessary instruments for communication: reader cards, bulletins, supports for micro-reproductions, etc.		B		
3. Determine the categories of users, establish conditions for each one, provide for sanctions in event of infraction	A			
4. Receive candidatures of users, accept or reject, place in a category	A & B			

	A	B	C	D
5. Make necessary consultation and information instruments available to users: lists, catalogues, etc.		B		
6. Provide them with oral or written advice and information		B		
7. Receive requests from users, check the possibility of communicating the documents requested			C	
8. Communicate the documents, register the communication or loan				D
9. Ask whether the corresponding payment has been made			C	
10. Check return of documents				D
11. Complain in event of delay or infraction			C	
12. Apply envisaged sanctions if necessary		B		
13. Order replacement of documents damaged or that have disappeared.		B		
9. *Communication of information*				
A. Prior analysis				
1. Analyse need/s, define user level/s, set up and keep updated the profiles of interest (in the event of selective distribution)		B		
2. Study existing modes of communication, fill gaps		B		
3. Determine the services to supply, the form of these services, the technical rules to be applied, the type/s of information to issue	A			
4. Determine the type of answer to be given in case of research on request		B		
B. Preparation of information				
1. Draw up list of internal and external usable sources		B		
2. Seek and select information		B		
3. Evaluate the information collected, criticize and interpret it		B		

	A	B	C	D
4. Apply the relevant technical rules to the information (A3)			C	
5. Draw up (or have prepared by automatic means) processed documentary products: bibliography, summary, etc., or consultation aids such as: tables, indexes, etc.		B		
C. Issue of information				
1. Set up and keep updated the card-index/es of end-users			C	
2. Prepare publications and have them edited (in liaison with technical services)		B		
3. Prepare the material elements to be submitted to user: documents, copies, extracts, dossier, summary note, etc.				
4. Check		B		
5. Ensure dispatch				D
10. *External relations*				
1. Make the service known to possible users	A & B			
2. Establish and maintain contacts with the other services in the firm, with similar centres, with professional bodies and others	A & B			
3. Establish and maintain contacts with suppliers, publishers, libraries		B		
4. Take part in conferences or seminars within the profession	A & B			
11. *Administrative and financial management*				
1. Decide upon the premises and buildings necessary, pursue constant action to obtain them, acquire the strength of will necessary to avoid becoming resigned never to obtaining them	A			

		A	B	C	D
2.	Intervene in building, distribution and equipping of premises	A & B			
3.	Determine the material necessary, order it and instal it		B		
4.	Establish staff needs: number, level, qualifications	A			
5.	Obtain credits, authorizations, allocations or creation of requisite items	A			
6.	Recruit personnel	A			
7.	Participate in management of careers, fixing salaries, promotion, etc.	A			
8.	Provide possibilities for professional advancement	A			
9.	Fix working conditions and ensure their application	A			
10.	Distribute duties, set up organization charts	A			
11.	Ensure the execution and co-ordination of duties assigned				
12.	Establish the service budget	A			
13.	Obtain the requisite resources	A			
14.	Check on the execution of the budget	A & B			
15.	Establish all statistics		B & C		
16.	Draw up all reports on activity	A & B			

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THE TECHNICAL AND FUNCTIONAL MANAGEMENT OF DATA PROCESSING SYSTEMS: ASPECTS AND PROBLEMS OF QUALIFICATION AND SPECIALIZATION OF PERSONNEL IN THE STATE ADMINISTRATION

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Concerning the use of automated systems for the processing of data, in Public Administration the most important problems are those connected with the training of managers at different levels of qualification and specialization. The rapid growth in the information processing sector and the shortage of trained personnel to run modern data processing centres has exacerbated the problem for the public administration.

Education in data processing must be diffused at all levels, although the state administration must train its own specialists since it cannot generally recruit them externally.

Specialists are needed to study the functions of retrieval and filing systems, and another group, programmers, operators, are needed to study and use automated information processing systems. The training of users is essential if new instruments for handling information are to be used in public administration.

I. *Introduction*

For the majority of firms and Government Departments in Italy, the sixties revealed a profound evolution in the organization and structure of the automatic informaton processing sector. This occurred in terms both of the opening of new, more complex areas of application, and a different way of conceiving business data processing so that it was viewed no longer as the simple material executor of repetitive and logically elementary work phases, but as a real instrument of decisions which was able to back up the management of the firm in performing the highest administrative and managerial functions[1].

The consequence — inevitable in certain aspects — of this change of orientation, of this evolution of functions and tasks of what can today justifiably be considered the operative nucleus of the majority of private firms and public administrations, was and still is, the increased importance of the problem of the preparation of those responsible, at various levels of qualification and specialization, for the functional and technical management of data processing systems. Indeed, in each phase of its activity the machine — however technologically complex and advanced it may be, and however refined and sophisticated its functions may be — is, and remains, a mere working instrument which can do nothing if deprived of the guidance of one capable of exploiting its capacity to operate, who from time to time imposes his specific requirements.

The problem of education in the disciplines concerned with automatic data processing can generally be posed on three different levels or areas:

- instruction (qualification and specialization) of personnel in charge of operating Data Processing Centres;
- instruction of company management on the scope, and possibly the limitations, of data processing[2];
- instruction of the users of automatic data processing, above all in order to establish a common language permitting mutual understanding with DP experts for the interchange of information.

In all these areas a great deal of work has been done, especially by the computer makers in their schools and specialized institutes, but there is no doubt that as the numbers of those interested in the DP sector increase, there is a proportional increase in the problems connected with an adequate, continuous, thorough instruction for a quantity of « pupils » which is constantly rising at extremely high rates of increase.

II. *The dimensions of the problem*

To be able to assess adequately the dimensions of the problem of preparing personnel for the data processing sector, it is best to consider for an instant the envisaged course of development of the sector in the ten-year period 1970/1980, in terms of the systems installed and, in particular, of the personnel necessary to manage them.

According to analyses made in 1968/1969 by a special Study Committee set up by AICA, the computers installed in Italy will rise from about 3,300-3,800 in 1970 to some 18,600-22,000 in 1980[3].

Again according to this Study Committee, the envisaged total number of personnel directly concerned in the technical running of the processing centres — excluding those having exclusively executive functions (punchers, operators) — will rise from approximately 16,300-18,800 in 1970, for the various specializations, to about 114,000-135,000 in 1980.

It is clear from these figures that the problem of preparing personnel is, in fact, one of considerable dimensions and requires the attention of business managements, of those in charge of Government Administrative Departments, and of all those directly or indirectly concerned with the problems of personnel preparation and qualification, as one of the major problems today requiring a solution.

Moreover, the trend of the data quoted above is matched by that deduced for other countries, allowing, in a number of cases, for certain lag constants which could have an influence in modifying, in time, forecasts derived for countries having different development conditions, or for which special economic and technological development plans are in being.

Clearly, the very fact of having to take measures, in the course of a decade, to bring the number of technicians, whom we can define as operational, for automatic data processing up to seven times that at the outset, involves a considerable mass of problems, if it is realized that this training effort must be accompanied by the corresponding and no less laborious task of spreading knowledge of DP concepts and methods more and more widely, in order to bring the output and the efficiency of use of data processing systems up to adequate levels.

It is in fact in this direction that much work has yet to be done. The development of advanced applications (data base, data communication, graphics, message switching, sensor based applications, etc.) involves the active participation in performing the various projects not only, obviously, of the technicians responsible for performing them, but also of all « users » in general interested in each of the applications. Moreover, this participation does not mean passively watching the development of the individual phases of the project, but a constant exchange of experience, suggestions and ideas with the DP experts; and such an exchange cannot take place without a conscious, profound knowledge of the techniques, the terminology and the operative philosophy of data processing.

III. *Problems of personnel preparation, with special reference to the Public Administration sector.*

One of the reasons why the problem of the preparation of the personnel of automatic data processing users is posed in such grave, and in many aspects decisive, terms, is undoubtedly linked to the rapidity of development which the information processing sector has undergone in the last twenty years[4].

This rapidity has not permitted the gradual, unbroken formation of the infrastructures needed for data processing to be inserted in private firms and, particularly, in public administration. The latter today feels more acutely the lack of specialized personnel in the area of data processing — personnel which, for that matter, in view of present legislation, it cannot acquire directly from outside, such as occurs for many private firms which in this way manage to meet the demand for experts without any special, excessive hardships.

The outcome of this situation is the fact that experts and skilled technicians not only exist in numbers which are already clearly lower than those needed for the entire State sector, but also form a reserve from which the private sector is constantly drawing.

Thus it is a matter of the greatest urgency to start specific data processing training plans going as soon as possible in all public administration departments, with special regard to the managerial branch, which, in the coming ten-fifteen years — i. e. when a high peak in the level of automation of Government administrative departments is likely to be reached — will be called upon to render its utmost services, in both quantitative and qualitative terms.

From what has been set forth so far, a number of basic aspects of the problem of personnel preparation are already clear. For public administrations, this problem may be outlined as follows:

— there is a limited availability of personnel qualified or specialized in activities connected with automatic data processing.

— The process of developing automation is still today entrusted to a restricted number of « pioneer » enthusiasts, who have made great efforts to extend knowledge of DP concepts over a wider basis. It is clear that as the area of applications, of projects and of services is extended, the isolated efforts of this limited number of persons will no longer be sufficient.

— Only in a number of instances have special rôles for personnel of the computer sector been envisaged. It is advisable to extend this staff re-organization to all Administrations, to help decide all those potentially interested to concern themselves with activities connected with automatic data processing.

— It is advisable, if not indispensable, to institute competitive examinations to permit technicians and specialists in data processing branches to gain access to managerial or executive levels.

— A process has only just started to include disciplines concerned with informatics in a number of secondary education institutes and science faculties of universities, in certain of which specific graduate courses in information engineering have been inaugurated. This first step, to be followed in the near future by phased extensions, aims at preparing technicians in the actual operation of automatic data processing systems. Regarding the fact that, as pointed out, it appears essential for the whole range of users of data processing systems to have an adequate preparation in the said processing, it must be noted that to date nothing has been done in this direction at the various levels and sectors of secondary and higher education. Studies and applications are, for example, today being carried through in the field of automatic documentation in the sector of legislation and jurisprudence, and probably, within a short time, there will be instruments functioning in these areas, which the latest graduates of our faculties of law and humanities

will not be capable of using, not possessing a minimum of knowledge of the capacities and possibilities of these instruments. A similar problem exists for other sectors (economics, medicine, etc.).
It is therefore to be hoped that instruction in data processing will be stepped up in institutes for advanced studies of the public administration, whose function could well prove to be essential in this delicate sector, as the medium of formation and information for personnel in Government departments, today finding absolutely new working instruments available to them.

We have reached a particularly delicate stage in the process of disseminating automatic data processing techniques. It is on the preparation of the technicians, and on everyone's knowledge, that the extent to which the new instruments will improve our working conditions over the coming decades will depend.

Schools, Government administrations and firms are engaged in this educational action, the starting of which, in many cases, and the stepping up of which, in others, today appears absolutely impossible to postpone any further.

IV. *Filing, retrieving and transmitting information in Government administration departments: aspects of the need for specialists for information work in Public Administration.*

The use of electronic computers has in recent years emphasized the problem of studying information flows within firms and Government administrations, and that of operating and using this information according to rigorously organized operational schemes in keeping with the logical functioning of automatic data processing systems. In this context, a start has been made in a number of State Agencies and Departments on setting up special Documentation Services. These have been assigned tasks not only of organizing the filing of the documents possessed by each Administration, but also of rationalizing the procedures for searching document files for the information required from instance to instance, and for transmitting this to the users interested.

These functions should obviously concern not just the bibliographical material kept in the libraries of the various State Agencies and Departments, but also everything which, in variously organized forms, represents the whole range of filed material whose information content constitutes the element on which a large part of the work of said Public Agencies and Administrations is based (central documentation files, statistical data files, data banks).

The development above all of modern concepts on data banks and the techniques of their setting up and management has given rise to the present keenly-felt need for each Department to possess its own team of experts skilled in the various aspects of data processing, which aspects range from modern document filing techniques to the latest techniques of indexing, searching, analyzing, submitting and transmitting them. These teams, while distinct from those dealing with aspects which are operational in a certain sense, connected with the use of automatic data processing systems as discussed in the preceding paragraphs, are in a sense an integral part of the latter, since for a correct and advanced mode of conceiving the problems of informatics they must always presuppose the adoption, at a certain phase of the logical procedure of managing and using information, of systems able to process in short spaces of time the large volume of documents and/or data nowadays involved in every sector of activity and particularly so in Government Departments.

Reference has already been made, in paragraph III, to the problems relating to studies and achievements in the sector of legislative and legal documentation, which already today require user-technicians capable of using the new working instruments which the modern technology of automatic data processing systems makes available to us also in the field of documentation.

These problems are today being extended to an increasingly more comprehensive range of possible fields of application. Suffice it to think of the needs in the area of economic documentation of the various national and international financial and commercial bodies; in the area of health documentation, of the Insurance and Assistance Agencies which operate on a nationwide scale; and those in the Social Sciences sector, acquiring such prominence in the widely varying fields of action of the Public Administration.

This, even without mentioning, for instance, the immense sector of scientific and technological research which in itself would require the allocation of considerable resources for the preparation of data processing experts, in line with current trends in the science of informatics, to be assigned the more and more urgent task of operating and using the huge amount of information that has been accumulating in these areas of activity, at extremely high rates of increase.

In conclusion, it should therefore be stressed that the need for information specialists and technicians occurs at two different levels. The first is represented by those assigned the task of studying the various functions connected with the filing, retrieval, use and transmission of information, and of applying the techniques pinpointed as the most appropriate. in each area. The second refers to the study and use of automatic data processing systems (analysts, programmers, operators).

Both of these contribute towards solving the problem of how to manage the data, the « explosion » of which is more and more decisively becoming a characteristic of the age in which we live.

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Dr. Marcello Morelli took an engineering degree at Rome University in 1960. He works for IBM Italy where he is concerned with the problems of data processing from the technical and commercial aspects, and, in particular, the problems of marketing of computers in the public administration and the aspects relative to the training of the personnel for the management and use of processing systems. He has published numerous articles and two books « *Organizzazione e Gestione del Centro Elettronico* » (1971) and a « *Dizionario dell'elaborazione dei dati e dei calcolatori* » in the same year.

TRAINING FOR INFORMATION WORK IN MEDICINE IN CZECHOSLOVAKIA

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The new programme of education of information workers at the Department of Library and Information Science in Prague is discussed. The details of the training conception for special information work in medicine are described: aims, content and requirements. Besides the general disciplines of library and information science with their application for science and technology, a complex of special medical-information subjects with consideration of special language training is proposed. This programme corresponds with the interest in the field of national health in Czechoslovakia which needs a number of qualified information workers in bio-medicine.

Until recently there has been little support for education for the respective professional qualifications for information work in any of the fields of science and technology. Now the planning of the State Information Policy in the Czechoslovak Socialistic Republic includes also training for library and information work at all levels, according to the needs of both industry and science. There are two library and information science schools at university level — in Prague and in Bratislava — where the education of information specialists is provided. The new programme is based on the present and prospective tasks of science, technology and management, with their information needs and, at the same time, on requirements of information science as a scientific and educational discipline. The programme contains three main fields of study, i. e. information science and technology, foreign languages and the subject-matter of one of the three specializations: technical sciences, humanities and social sciences, and natural sciences.

In the field of information work in the natural sciences there is an urgent demand for university qualifications in medical libraries and information units. Therefore the above-mentioned new programme of education of information workers provided by the Department of Library and Information Science in Prague, which is to come into use in the school year 1972/73 will be oriented towards the training of information workers in biology and medicine, in co-operation with the Prague Medical School. The project is based on foreign experience, on the results of the current practices, as well as on opinions and suggestions of prominent medical and information specialists in our country. Thus the necessary professional profile has been conceived and the proposal of the syllabus elaborated.

This part covers only the training for special medical information work, which represents about one third of the five-year full-time study course in the Department. The other components are three foreign languages (competence in two world languages, working skill in one) and the general information disciplines in the following structure:

- Sources of information, communication of information;
- Users of information, information needs;
- Acquisition of information;
- Information storage, classification, abstracting;
- Information retrieval, bibliography, selective dissemination;
- Information systems;
- History and theory;

including the related theoretical and methodological disciplines:

- Philosophy, psychology, pedagogy, sociology, economy;
- Mathematics, statistics, logic, semeiotics;
- Cybernetics, management, and systems sciences, programming and computer science.

These components of study are the subjects of research and application by several teams. Our specific task is to prepare the study syllabus of medical specialization.

In suggesting the content of the syllabus for information work in medicine we must consider some essential aspects:

1. A medical information worker will not be a substitute for a physician; he will provide neither diagnosis nor therapy.
2. A medical information worker will become an active member of a research or clinical team, collecting relevant information and evaluating the state of knowledge in the respective thematic fields.
3. A medical information worker must master wide general bases of biology and medicine, particularly the theoretical and related ones, with emphasis on the terminological aspects.

4. A medical information worker can obtain any kind of special qualification for any medical discipline by means of post-graduate study.
5. A medical information worker must be able to manage, administer, propose and control any part of an information system in the field of biology and medicine.

These considerations are reflected in the conception and structure of the syllabus. The general information and linguistic parts of the study will continue in the special information and language components. Besides special medical and information terminology the etymology of medical Latin/Greek terms will be studied. Special information disciplines as applied in medicine are proposed in the following structure:

— The communication process in medicine;

— Organization of information work in the health sciences;

— Specific information needs and their users in research and clinical work;

— Specific sources of information in medicine;

— Information storage and retrieval in medicine (MEDLARS);

— Theory and literature in medical information work.

The major part of the study is the complex of special medical disciplines for information workers. It involves, on the one hand, general knowledge of the structure, methodology and organization of the field in the most advanced countries, with special regard to the conditions in Czechoslovakia. On the other hand, it includes special studies of medical areas at the level of the needs of information work:

— The aim of the training in theoretical disciplines is to acquire knowledge of the physiological structure and functions of the human organism, i.e. anatomy, physiology, biology, chemistry.

— Pre-clinical disciplines will illustrate the symptoms by which these features are manifested under pathological conditions - pathological anatomy, pathological physiology, micro-biology.

— Clinical disciplines will apply the obtained knowledge to medical and surgical practice.

This part of the study of applied information science and technology is the most relevant and responsible. The preparation of the syllabus, lectures, seminars, special studies, practical work and textbooks is provided by the co-operation of the team of medical specialists with information scientists and lecturers.

Naturally, the requirements of the study will be reflected in the admission procedure which will give preference to students interested both in life sciences and in languages, who are willing to undertake university study in general and applied information science and technology.

The programme is only one of the proposed syllabuses at the Department of Library and Information Science of Charles University. The Ministry of Health's demand for qualified information workers corresponds with the idea of specialization in training for information work in medicine. In this way a qualified information specialist will become a member of the medical team, equivalent for example, to the bio-chemist, computer scientists or psychologist. Today it can be said that public health care depends on the level of medicine; this level, as well as progress in medicine, depends on the scientific information system.

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PRINCIPLES OF WORK-CO-ORDINATED TRAINING FOR INFORMATION SPECIALISTS

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Two over-riding principles for training of documentalists are: coordination, and perspective. Optimum coordination *of instructional training and productive work to maximize training efficiency is achieved particularly by designing maximum feedback into the training program to facilitate self-teaching, thus both minimizing instructor's investment (loss from productive work) and speeding the learning process. Organization of the documentation task into an ordered procedure that helps the information specialist maintain* perspective *over the whole and the parts of the item on which he is working facilitates the achievement of high-quality work that is human-indexing's raison d'etre. The detailed description of a proposed on-the-job training course illustrates how these principles may be achieved.*

This paper is concerned with on-the-job training for new documentalists, who are frequently brought into an information service on the basis of *subject-matter* expertise, for comprehension of the materials with which they will be working; frequently they have little or no background in information science — abstracting, indexing, classification systems, vocabulary structures, search techniques, etc. This can be a particularly severe problem for *a.* services which utilize several different classification and indexing schemes, or *b.* in services which require complex, highly-structured, detailed and extensive (deep) indexing of the documents they cover *.

An organized training programme is needed in order to avoid floundering aimlessness during the early part of an information specialist's affiliation with a given information service. If the programme is properly designed and executed, even an inexperienced documentalist can be expected to become a valuable productive member of an abstracting-and-indexing staff during his first few weeks. It is essential that training be co-ordinated with a programme of gradually increasing production responsibility, so that the indexer can gradually and continuously pick up a good deal of information (often learning things before he necessarily needs or will use them), but naturally in the course of productive work, rather than in painfully undirected non-productive study; so that a special study programme separated from productive work should be avoided.

During his training period, whether formal or informal, the documentalist will of course develop work habits and procedures which will tend to stay with him permanently, and will be very difficult to « unlearn » even if wrong. Perhaps the most important feature of a proper programme is that it must train the documentalist always to maintain his perspective in evaluating and indexing subject material: the literature he is covering. Diligent, and basically capable, but improperly trained indexers, may be seen to do thorough and accurate indexing that covers ninety per cent of the principal concepts properly, but overlooks the most crucial or important ten per cent, thus losing sight of the forest for the trees. Therefore, it is crucial that the training be organized so that each new detail is presented within the framework of the information system as a whole. Again, a *special* study programme separated from (and thus without the perspective of) productive work, is likely to emphasize the difficult aspects of information storage retrieval and of indexing details (which provide, say, a « fine tuning » to basic classification and which are meaningless if basic classification is inappropriately applied); and such a special study programme is likely to create a seriously distorted approach to documentation work. A co-ordinated programme of gradually increasing production responsibility, with initial emphasis on evaluation and basic classification and only gradual introduction of increasingly detailed aspects of indexing, will make for a programme, that is both efficient (minimum non-productive time on the part of the new documentalist) and successful (the development of good work habits and a good approach to documentation work).

To illustrate the application of these concepts, a specific programme is described below. It was developed for a project [1] for abstracting and indexing technical articles which required both *a.* the utilization of several different classification and indexing schemes, and *b.* complex, highly-structured co-ordinate deep indexing, for computerized information storage and retrieval. The overall information system included a general basic system of subject classifications and category numbers, and also a system of specialized indexing within precise disciplines; the latter system included a special subcategory vocabulary, a thesaurus for assigning two levels of « descriptors » (a principal level for use in published indexes which in addition require the writing of a « Notation of Content » or improved title for each document; and a second level, more extensive, for inclusion only in machine files), and a system, also for inclusion only in machine files, of « rôles » and « links », and « subdescriptors ». and « connectors » for further specification of the descriptors.

The training programme consists of four phases, as follows:

Phase 1 (three weeks):	General familiarization, writing abstracts, indexing for the general basic system.
Phase 2 Part *A* (one week):	Introduction to the worksheets used for the specialized-indexing system; special subcategory vocabulary; selection/exclusion of individual articles; writing « Notations of Content ».
Part *B* (three weeks):	Assignment of principal-level descriptors; familiarization with thesaurus structure.
Phase 3 (two weeks):	Intensive training in the mechanics of deep (co-ordinate) indexing with rôles and links, subdescriptors, connectors.
Phase 4 (three weeks):	Development of abstracting and indexing and retrieval principles, search techniques, machine file structures.

During Phase 1, the new documentalist works only on writing abstracts and the general basic system of subject classification and category numbers. He learns to write a suitable informative abstract, what the local rules are on style, abbreviations, punctuation, length limitations, use of mathematical or other symbols, etc.; and becomes familiar with the principles of classification in general and the basic system's subject headings and category numbers in particular; and he becomes immediately a useful, productive staff member. His work is closely reviewed by a helpful experienced documentalist who provides feedback in the form of suggestions for improvement, and who adds the specialized-indexing work needed for processing the material.

Phase 2 begins once the novice is found to be consistently producing quality abstracts, and demonstrates a good understanding of the general basic system. For one week (part *A*), in addition to abstract writing and general/basic indexing, he makes a judgment on each source document (primary journal article) as to its suitability for inclusion in the information service, and for each that is suitable, assigns a worksheet, special subcategory vocabulary code, and Notation of Content, under continuing close supervision.

An expert indexer is then assigned to work closely with the new indexer for Phase 2 (*B*), beginning by a re-review of all the work done by the new indexer so far, to check that he accepts it as being of good quality. The new indexer now expands his work on each document to include the assignment of principal-level descriptors (selected from the thesaurus) beginning with the partially completed documents prepared in Phase 2 (*A*). He now needs to familiarize himself with the basic features and content of the thesaurus, assisted at an early point by several hours of discussion with the staff responsible for its continuing design and development. The expert indexer will closely review his work, and independently add the needed second-level descriptors and rôles, etc. (the « deep » indexing) to complete the work for processing. The new indexer must not yet get involved in this work, although he does spend several hours with the information systems specialist, for background, further details of thesaurus structure relevant to co-ordinate (deep) indexing, machine file structure, and principles of file search.

By the beginning of Phase 3, the indexer will have become adept at determining the main concepts of an article from the point of view of the overall objectives of the information service, and this perspective must be maintained as he gets into the greater detail of deep indexing. First the indexer reviews the deep indexing of his own Phase 2 documents, done by the expert indexer. He is thoroughly familiar with these documents from his own work on their abstracts, Notations of Content, principal-level descriptors, etc., and can most quickly grasp the basic principles and mechanics of deep indexing by studying the expert indexer's work on these documents. In addition, the expert indexer can then explain in more detail why he indexed these documents as he had. Following this review, the new indexer is expected to do the complete abstracting and indexing on each (suitable) document. However, for the two weeks of Phase 3, his production is very low, as he rigorously follows the pattern for each document of first completing only the work learned in Phases 1 and 2 (but not the deep indexing), then writing down explicitly a stylized indicative abstract (of which the deep indexing is a structured representation) and finally completing the deep indexing with rôles, links, subdescriptors, connectors. His work is reviewed not only by a subject-area-expert indexer but also by an information systems analyst who may not necessarily be familiar with the subject matter area, so for this relatively short period the stylized « abstract » is essential to facilitate the reviewers' check for comprehension of indexing rules (as opposed to questions of subject matter comprehension). With detailed feedback from close reviewing every few days, he should have an accurate understanding of deep indexing within two weeks.

Each documentalist works a little differently from every other, and during Phase 4, the indexer develops his own procedures for optimum efficiency. Only the continued close supervision of this final three-week phase mark it as being still within the training programme, and it is intended to assure that with increased flexibility and speed of operation, quality is maintained. But it is absolutely essential, indeed as much as any of the preceding phases, and must not be skimped.

Despite the complexity of the indexing system that requires that the training programme covers twelve weeks, the novice is substantially productive from the second or third week, except for the two weeks of Phase 3, and by the end of the twelve weeks should have approached the proficiency of other (more experienced) expert documentalists.

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[*] By proper system design, large-scale information services should avoid falling into either class *a.* or class *b.* Regarding *a.*, if indexing for various schemes is ultimately required, these should be correlated so that the intellectual indexing work need be done only once in a single scheme, and the indexing to other schemes can be derived, via the correlation, by clerks or by computer operators. Regarding *b.*, large systems should look to automatic indexing, or better, to rely on sophisticated search systems capable, for example, of effective full-text search of abstracts, in order to avoid overly expensive investment in detailed indexing. There remain, however, smaller information services which cannot justify either of these solutions, or which can justify expensive, thorough indexing of a small body of extremely important documents.

[1] For earlier, fuller descriptions of the project, see Automated Maintenance of a Highly-Structured Thesaurus at Engineering Index by W. G. Hohnecker and W. G. Newmark; and Experimental SDI Products and Services at Engineering Index by F. R. Whaley and E. A. Wainio, Oct. 1967. Both in *Proceedings of the A.D.I.*, *4*, 296-300.

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INFORMATION IN THE EDUCATIONAL SYSTEM

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The difficulty of introducing the principles of information science in the Italian educational system is discussed. The theory of information is accepted solely for its methods and instruments while the content of scientific culture is ignored.

Reference is made to the erroneous way in which the introduction of scientific culture in schools has been attempted and to the instrumentalization of science for power purposes which has provoked the justified protest of students and workers.

The author concludes that the introduction of information science in the educational system requires a global revision of that system in order to ensure that the contents of science, as well as the means and the instruments, are introduced.

From time to time some interesting experiments are tried within the Italian educational system, (which is always in a state of crisis), which have the aim of bringing scholastic tradition closer to contemporary reality. There are various reasons for such experiments of which some are inherent to the educational system, but they can also be explained by the fact that a technical innovation which in any way modifies social relationships can only have widespread effect if taken up by the country's most influential structure for social change. Therefore the science of information must become part of the general educational system so that it can affect all social categories. Its future will be assured in this way as it could not be if it were merely taken over by the productive processes, since it will become an aspect of the life of the entire society.

Not everyone accepts this, therefore the introduction and development of the science of information in the educational system, as in the social system at large, must have clear political objectives.

The science of information will be applied, in fact is already being applied, in various sectors of production and public administration, bringing about concentrations of power both in the production of the actual instruments and in the administration of information.

Even if we leave aside purely economic factors, we must look into the social factors that are becoming a matter of urgent concern: the « de-qualification » (qualifications strictly limited to technical competence) of those who handle information, the invasion of private life which can be analyzed in minute detail, the possibility of complete control of work, the centralization and concentration of information and power with the consequent exclusion of the majority. From this it follows that whoever takes up the task of translating the science of information into educational terms will have to deal with problems that are not strictly scientific or didactic, but are specifically political. Let us consider some of them.

To take an Italian example, there is in the first place the difficulty, in fact the near impossibility, of introducing the so-called scientific culture into the educational system. This is a serious problem, though it might appear to further the cause of the science of information, it would in fact be likely to bring out the negative aspects discussed above. It is easier to introduce techniques rather than contents into the Italian school system. This has two fundamental causes: the first is that science is mistaken for technique, the second is that the market for educational instruments offers blandishments as does any other market.

The science of information would therefore penetrate the school system through its technical means of dissemination. It would introduce, more rapidly than any other science could, its own *method*, and because of this method it would come to be accepted as a scientific subject. This is completely contradictory to the opinions of those who want education to concern itself with science, and therefore also with the science of information, for it is by virtue of the content of science, rather than by its method, that an effective relationship between education and daily experience can be introduced into the educational system.

This disguised resistance is difficult to overcome. It is reinforced by those who want to introduce science without contents, in order to make use of its instruments and methods. The first consequence of this is the training of staff capable of working the machines, but rather less capable of programming them or of understanding the implications. Therefore the « hallucinating prospect » mentioned above, dequalification of personnel and concentration of power, will be brought about through minority but extremely powerful élites.

Another political problem that has come up in the past few years is the opposition to science on the part of workers' and students' protest movements. First let us consider briefly student opposition.

The search for new channels for transmitting knowledge, but above all the calling into question of the aims of contemporary society, have often led to science itself being called into question, sometimes in rather dramatic ways. We cannot go into this here but should, however, remember that behind this revolt there is not only the desire to return to a vague humanistic philosophy, but also a protest against the uses to which science has been and is being put. Protest because it is through science that whoever is in power is able to remain in power and be in a position to lead society against its own best interests. It is sufficient to remember Los Alamos, or the terrible conflicts in the East, where we see human energy resisting monstrous military techniques with its own form of violence.

It could be objected here that *art* has also been contested. « Art is dead » was written on walls in Paris in 1968. But if we analyze this protest we see that it is not art, rather art that has been developed by patronage, or within a society that has as its objective domination over nature which, however, divides nature from nature, making science and art instruments in the service of final objectives that are contrary to man's peaceful evolution. This is why the science of information can be equally, in fact even more strongly contested, since in its practical applications it can be used more than any other science to serve objectives against man's best interests. It is probable that the protest against the science of information will make more extreme the protest against science.

How can these two fundamental problems be overcome or, to state it better, how can we fight against the science of information being made an instrument in the service of objectives not in keeping with the development of society?

This brings us to formulate questions, and to try to discover how in practice the science of information can be introduced into the entire range of human activities. First of all it is essential to concentrate on the formulation of what the objectives of the science of information should be. These can be stated in terms of a new definition of the principle of rationality which should, however, recognize the connexion of rationality with science, so far administered as the instrument of one culture over another, but which should be identified with a universal and free conception of the development of the whole of humanity.

It is undoubtedly easier to define the fields where the science of information can help man in the struggle against nature and against himself. Medicine, biology, the sciences that concern man, will benefit from the development of the science of information and, in turn, through the objectives that they are trying to reach, they will be able to contribute to the definition of the objectives of the science of information and of science as a whole. This will minimize the drawbacks and disadvantages that could arise from introducing in isolation the science of information into the general educational system. However, consideration should also be given to the fact that the educational system must be completely reformed before the science of information can make any impact on it. In other words it is not only a question of injecting into existing educational structures the principles of a new discipline, rather it is a question of reconsidering from every angle what the education of modern people should consist in. We have a vast field to analyze, which has at least two dimensions: spatiality of educational and cultural structures in a broad sense, and depth determined by the span of time in which a man can give substance to his culture. This analysis is necessary, not so much to give structure to a discipline within the context of systems of knowledge useful to general education, but rather to enable anyone, regardless of formal education, to have the possibility of cultural development that will not be damaged or upset by the introduction of rapidly evolving scientific concepts. The example that comes to mind is that of the operator who works with an electronic computer and is therefore, in a small way, in charge of a segment of the productive process. The same man outside the factory is continually manipulated by other productive processes that he is unable to administer, still less to control, which he cannot even imagine. This in spite of the fact that the technology is the same.

This explains in part the workers' protest against the science of information, but we cannot consider this at length in this article.

It would be unwise to try to introduce science in any form into the general educational system without involving the civilian structure of the country with the entire educational process, which has implications for the science of information. The situation today offers a great historical opportunity; if grasped, and good use made of it, the rapid rate of technical and scientific evolution can contribute to overcoming social imbalances. It is still difficult to see clearly the details of such an important process, but the objective is a new form of literacy, available to every member of any society that wants to overcome its internal contradictions and backwardness.

Though the same basic elements are involved in a school or in a factory, the preparatory work may be somewhat different. To state this more clearly, to introduce into any structure a principle of the science of information some groundwork is evidently necessary, possibly complex modifications or procedural simplification, in order that the computers accumulate the maximum information and give it back in the minimum time. This process will lead to the raising of the standard of critical and creative capacities on the one hand, and the reinforcing of democracy on the other. If this is valid within a working organization, it follows that it should be studied and expanded so that it could be applied to the entire society.

This could become the objective of the science of information within the general scheme of the evolution of society. Its introduction into the educational structure, inclusive of the means of cultural diffusion, consumption and production, can only be acceptable on condition that it be considered a strategic move leading to substantial and far-reaching changes in the development process of the entire society.

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TRAINING, ACTIVITIES OF THE GROUP OF BIOMEDICAL LIBRARIANS OF THE ASSOCIAÇÃO PAULISTA DE BIBLIOTECÁRIOS

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The paper presents two projects developed by the Group of Biomedical Librarians of São Paulo aimed at the professional improvement of its members and efficient training of the users of its libraries through classes of bibliographical research and information dissemination.

Introduction

A group of São Paulo librarians, compelled by the necessity of obtaining a better mechanism for studying and solving the problems which are common to libraries in the biomedical field, and with a view to accomplishing a co-operative project, started, in June 1963, the Group of Biomedical Librarians, affiliated with the « Associação Paulista de Bibliotecários ».

One of the Group's major purposes is the professional improvement of its members with the resultant training of the user of scientific information.

The rôle of the biomedical librarian in assisting the scholar is most significant; the aid and training which he will give the user will depend on his knowledge of modern techniques in dealing with information: its organization, retrieval and dissemination.

While it is certain that the majority of scholars depend on the directives which the librarian will give to the guidance of research techniques, outlining the various stages of the process which will provide efficiency and speed in obtaining a specific piece of information, questions remain: is individual guidance of each scholar warranted? Are new students, or potential researchers, to be introduced into the Library merely through the enrollment card? How are the paths of the scientific world disclosed to them?

The members of the Group of Biomedical Librarians (GBB), concerned with providing the scholar with dynamic training and having this as one of its aims, decided to carry out an effective programme which might reach the user in the fullest way. Thus, various tasks were scheduled, two of which are presented here, as they are considered of the greatest importance and have already been put into practice.

For a few years various Libraries, which are GBB's members, have provided the students enrolled in graduate and post-graduate courses with classes of bibliographic research. These classes have been developed on a reasonable scale as a curricular discipline and as a course sponsored by Specialist Departments for students of various Faculties of Health Sciences of the State of São Paulo.

In view of the success obtained, the BGG decided to endeavour to obtain the extension of such courses to all Faculties of the country. In this respect, during the first National Meeting of Biomedical Librarians which was held on the occasion of the Sixth Brazilian Congress of Librarianship and Documentation, in July 1971, in Belo Horizonte, State of Minas Gerais (Brazil), the following proposal was submitted:

> That a Committee of Biomedical Librarians be created in each unit of the Federal Union, in order to study the possibility of including in their institutions the discipline « Technique of Bibliographic Research and Planning of Scientific Work » at the various levels of undergraduate, and post-graduate courses and for the preparation of a programme with the minimum hours necessary to obtain the above skills.

This proposal was unanimously accepted, the São Paulo Group being selected to co-ordinate the work and prepare an official document to be submitted to the Ministry of Education and Culture.

We intend, thus, to implement this training on a medium and long term basis, not only in medical schools, but also in the other areas of education, both at a medium and an advanced level.

As complementary training of the user in securing information, the GBB looked for a more rapid system of disseminating the developments of scientific research, by scheduling the edition of the INDEX OF CURRENT PERIODICALS, Series I - Biomedicine, started in 1970.

This publication provides the scholar with the new contributions contained in 380 headings of foreign and 93 national periodicals in the field of the health sciences, offering an immediate digest of the literature in condensed form and thus without loss of time. Headings are represented through the reproduction of the « contents » of periodicals headings are supplied by eighteen Libraries which contribute to the publication.

The layout therefore is made by division of subjects, in alphabetical order and, within each subject, an alphabetical order of headings. At the start of each issue, there is an analytical subject index of the periodicals listed and, at the end, an alphabetical list of indexed titles.

Besides quickly imparting the information to users, it also allows them to obtain immediately copies of the works in which they might be interested, through co-operative Libraries.

Besides reaching the user directly, the IPB contributes to the enrichment of those Brazilian Libraries which have limited funds and which are not in a position to subscribe to the periodicals listed in the publication.

In the one year since its introduction, the need for a subdivision into specialized sections was felt in order to take care of the constant requests of professionals in the health sciences. Therefore, from 1972 the publication will be subdivided into sixteen sections, published every fortnight and gathered every two months.

Comment and conclusions

These achievements, although not original since they have already been attained in other countries, are significant in our country in view of the very limited means that we have available for work of this type.

In this respect, the GBB has co-operated fully, as it is convinced of the utility of such initiatives for the efficient formation of the future health profession and for the updating of the scholar and the researcher.

It should be pointed out that the projects cited, particularly as regards the IPB, were begun without any financial aid. It was possible, however, to count on the understanding of both official and private bodies, which assisted and supported the performance and publication of the IPB.

Consequently, it becomes clear that there is an urgent need to encourage every initiative that could contribute to the improvement of the intellectual level of already trained or future technicians. These activities, although they have been carried out with no resources other than the human, will always have a concrete possibility of achieving their goal for the simple fact that they are the outcome of the work of a team of information specialists.

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WHAT CAN BE DONE IN ITALY ABOUT THE PROFESSIONAL PREPARATION OF INFORMATION AND DOCUMENTATION SPECIALISTS

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The paper refers to the critical situation in Italy in the training of information specialists and after some basic considerations, two solutions for the rapid improvement of the situation are put forward: 1) to give concrete support to the FID Education and Training Committee in order to make full use of the teaching programmes and methodologies prepared by the Committee in the documentary and information sector; 2) to use the international and national rules prepared by the bodies concerned with the unification of the sector, as the principal object of the teaching in professional courses for documentalists.

What stage has been reached in Italy in the preparation of specialists in the field of information?

This is a question still awaiting an answer. A positive answer, naturally, because several negative answers have been given in the past ten years. I remember a conclusion reached at the Convention on Professional Training and *Updating* in Document Techniques, held in Turin in 1965 at CSAO: « In Italy, *documentation* has yet to be inserted as a system in a structure of systems... It is necessary to take measures to inform the active individual right from his school education... ». There followed a number of proposals which it was not possible to implement [1].

Prof. Bisogno, at the recent *R.T. Round table on Informatics Culture and Italian Society* promoted by the Agnelli Foundation, said the following about preparation and training for *document information*: « The situation in Italy of research and achievements in the field of document information is very disappointing. It is characterized by a wealth of short-term initiatives, which however do not succeed in making any noteworthy impact on reality » [2].

In a paper of mine in 1968 on the profession of the *documentalist* in Italy, I showed that the gap between the USA and Italy in the percentage ratio between documentalists and researchers was two to one and perhaps more. And — even more important — that Italian documentalists were more inclined to « work for the catalogue », or to be considered as « instruments of communication rather than of information » [3].

Today the situation is even more confused due to the unthinking use made of the word « information ». Taken up by our mass media, it is used practically in every activity connected with computers.

Hence, when mention is made of information specialists and their problems, one's thoughts quickly and easily fly to « electronic brains » (another unfortunate expression popularized by our domestic mass media), but slowly and with disdain to libraries and documentation centres.

In order to give a rough idea of documentation in Italy, one can perhaps conjure up an archipelago rather than the whole peninsula. A great deal of documentation and information is produced and treated, but still in very home-made and autonomous ways. There are but few instances of co-operation, and therefore there is little regularization of the methods used in work, and the products are varied.

In this context, the difficulties besetting the training of DI specialists may be deduced.

The very few Italian organizations giving any instruction at all in this field give just general, summary notions. From these the trainee will glean elements for « his » own achievements, probably different from others that exist, and which are difficult to interchange.

Otherwise the specialist is self-instructed in devising methods, adapting them progressively to requirements, and thereby obtaining products with no guarantee of stability (how many cards and card files change their aspect with the coming and going of men and the passing of time).

Jokingly, one could say that our « information specialists » aim at the peak of specialization: each one with his own « special » production.

With the gradual, slow changeover from normal to semi-automatic or fully automatic systems, things do not appear to change in a decisive way. There is, to be sure, an aspiration toward rules that enable the document output of others to be used as input. But faced by the time and patience necessary to put things into practice, many desist and do things their own way, thereby multiplying products which are actually basically the same.

I think that from what I have said where we are heading is all too obvious.

In such conditions any country, not just ours, would find itself in difficulty (and they do, in fact). Before instruction there is need for research; it is necessary for research to become consolidated in a « grammar » which permits « practice ».

We are not at this stage (in the context of DI, that is to say).

Prof. Bisogno is right when he bemoans in the document cited the scarcity of DI research. Little research and — incredible for documentalists — little use of the research carried out by others. Allow me to say this: in fifteen years I have done and seen something of everything!

Let us get this straight. It is not altogether the fault of the specialists. A lot of it is due to those who ought to stimulate and help and not just follow the specialists.

To come to the point.

How can we take advantage of other people's research, in order to reverse the trend towards dispersion which characterizes the situation?

There are at least two possible ways and both are open to us. FID - whose merit it is, with INI, to have promoted the Conference - has for some time had an active Committee on « Education and Training » (previously « Training of Documentalists »), which follows and studies whatever is being done in the world for the formation and updating of DI specialists. *The result of this Committee's work is within reach: the hand has merely to reach out.*

Herein lies the little Italian drama: never having the means necessary to put accumulated experience to our use.

In the many years it has been my honour to represent Italy on the FID/ET Committee, I have never succeeded in obtaining what was necessary, and this is little enough, to participate in the sessions, or to enable others to participate. Every request for this has always been rejected, even by bodies which officially represent FID in Italy. Yet the advantages to be gained from active participation are clear enough. INI proves this by the commitment entered into in organizing this Conference.

The above applies before all to the programmes and methods of instruction.

Regarding the subject to be dealt with, it is clear that every course should aim at the ends required by the environmental situation in which the trainees must or will have to operate.

Here the second way comes into it, to complement the first one.

We all know that international and national unification bodies too are very active in the field of DI. *Why not take advantage of the considerable number of norms that exist and make them the principal object of instruction?*

Unless a childish game is being played before our eyes, in which everyone — to some extent — is a participant, then the ISO and UNI tables should certainly be of some use, even to us. And if, subjected to the rigour of the test, these should prove below par, well, the

School would acquire its full significance in a comparison between experience gained and trials under way.

I, on my own very modest account, have carried out such tests and trials with colleagues of the first rank. They have never let us down. We have always derived benefit from them with the rapid insertion of young people and the simultaneous improvement of the regulations.

Certaninly, this is not the whole picture: the little world of DI is big when viewed from inside. I consider, however, that profitable steps forward, satisfactory to documentalists and to those aspiring to be such, and the firms and agencies that employ them, could very soon be made and in a homogeneous manner, as the profession requires.

I conclude by appealing to FID and INI, that the decisions necessary for the solution of this important problem of ours may be forthcoming from this Conference. As authoritative Italian colleagues have already said, the age of self-taught documentalists has to end. And it should end well, as has been the case with other human activities, with good schools to form and update the documentalist's knowledge.

He will take care of the rest, of the work: and better than before.

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THE IMPORTANCE OF HUMANITIES RESEARCH TO INSTRUCTION IN INFORMATION SCIENCE

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The generally accepted area of use for computers in mainly in the scientific and commercial world; computers have proven their worth in these areas. Humanities research dealing with verbal data raises the problems of manipulating large amounts of data, of handling diacritics, non-Roman alphabets and even non-alphabetic data. Even thornier problems are raised by disciplines such as musicology, archaeology and art history, whose data is not even verbal. Yet solutions to these problems will bring precious advances in such fields as library organisation, and analysis of algebraic or chemical formulae. The challenge to Information Science is to bridge the gap between humanists and electronic equipment by setting up specialized courses aimed at humanities applications, by devising new languages, and by exploring the capacities of existing languages for these applications.

Interdisciplinary sections at professional meetings, both of humanists and of information scientists, summer institutes for initiating humanists into comuting techniques and specialized research centres show that Information Science is already taking up the important challenge presented by humanities research.

The areas of use for which the computer was originally invented — the matematical aspects of science and commerce — have in recent years begun to approach a satisfactory level of utilization. The general lines seem to have been laid down and now need only to be filled in by increased intensity. But humanities applications of the computer show that these general outlines do not encompass the full range of the machine's potential and that its full utilization as a symbol manipulator depends on the imagination of a growing group of researchers.

The major activity among humanists today is the class of verbal data processing which is employed for the various types of literary, linguistic and historical research, and for such projects as the production of dictionaries. At present, several computer-generated dictionaries are in progress, including two for world languages — Italian and French — and others for dead languages like ancient Greek and Anglo-Saxon.

Other aspects of verbal data processing involve non-roman alphabets. While the Russians may be making adequate advances with Cyrillic on their own machines, there remains the problem of such languages as Hebrew, Greek, and Arabic, where the need is not matched by strength in the marketplace. Here specialists are devising ingenious substitutes for characters not provided on the standard input devices, stretching the capacity of the machine to store and reproduce an ever-growing repertory of orthographic symbols. More challenging are non-alphabetic writing systems such as Chinese and Japanese. Humanists have already involved themselves with Mayan hieroglyphics and Minoan linear script. They are developing new procedures for encoding ideographs and generating them on cathode-ray tube terminals.

Of additional importance is the humanists concern with materials which are not only impossible to quantify, but also are not even satisfactorily reducible to verbal symbols. In musicology, for example, the aspects of even a short and simple score — all the pitches, timbres, durations, simultaneities — create an almost bewildering confusion. When one attempts a catalogue of musical themes, one is immediately bereft of the cataloguer's prime support, the alphabet. Totally new rationalizations of these materials must be devised on the basis of their content alone, as analyzed in terms of these non-verbal values.

Ultimately, the humanist reaches out into areas, like archaeology and art history, where no system of symbols has yet been developed. In the past, the difficulties of indexing such collections has deterred the creation of a thesaurus of indexing terms. Now, the possibilities of computer indexing and computer networks have inspired collaboration in these fields, with the aim of establishing standard codes for the wide range of objects collected and studied in these disciplines. The Museum of Modern Art in New York, for example, has stored its entire catalogue in machine-readable form, as a first step toward a Museum Computer Network intended to embrace a consortium of institutions along the eastern seaboard of the United States. Archaeologists, also, are meeting on both sides of the Atlantic to determine how best to encode a range of artifacts that includes tiny seal rings and the temples of Ankor Wat.

This research has impact beyond the primary interests of humanities scholars. As more humanists become involved in computing they may, by interchange of ideas, encourage computer scientists to address such problems as encoding in new formats, storing and retrieving in larger quantities, and other challenges peculiar to humanities research. The experience gained in manipulating data in non-alphabetic forms should show the way for commercial and technical applications—even the processing of algebraic symbols, and the formulae used in physics and chemistry. The problems of classification which the editors of dictionaries must solve are related to those of librarians, who are recognizing a growing intimacy with linguists and other processors of verbal data. At bottom, the attempts to rationalize language and its accumulations in books represent parallel and perhaps identical endeavors, whose success also seems essential to the stabilization of technical language and the introduction of new technical terminology.

Perhaps more important is the fact that as information scientists turn their attention to the problems raised by humanities research, they bring about a situation unparalleled in intellectual history since the Middle Ages. Mathematical, scientific, and engineering applications of the computer are taken for granted. The social sciences are using it for statistical analyses. Medical schools, library schools and business administration faculties have discovered its use for storage and fast retrieval of data. Computerized production of music and of graphic design is well known. Like the deductive philosophy of the Middle Ages, information science now occupies a pivotal position in the academy; all the other disciplines look to it for a methodology.

This analogy can perhaps be carried further. Deductive philosophy was suited to theological investigation which was a primary interest in the Middle Ages. It was also applied to the natural sciences with less felicitous results. When scientific research moved away from the deductive approach, philosophers — rather than reaching out to a new field of study — hardened their position and treated these new endeavors as aberrations. Over the long term, the result was the shrinking of philosophy to the rather insignificant place it occupies in the modern university. There is a danger that information science retrenches itself in the mathematical applications which are its primary interest today.

Researchers in the humanities, where mathematics are almost never used, have already approached the computer with a different set of values, some of which can force the rethinking of many assumptions and thereby open the way to new and rewarding areas of investigation. Information scientists in particular should stand as a link between knowledge in the abstract and the mechanical means of acquiring it. They should benefit greatly from an awarenees of how their humanistic colleagues are teaching computers to do their work. But there are signs that such is not the case. This presentation is not the place for « horror stories », but in hardware design, in choice of hardware, systems design and billing policy at research computer centres, even in project design when information scientists and humanities scholars collaborate, one can detect a tendency to ignore the wider vistas which humanities research offers to information science.

Even as the growing number of departments of computer science or information science embark upon their mission of transmitting accumulated knowledge to the next generation, they must continue to widen their horizons. The expansion of computer applications in the humanities will encourage many more students to enter a field where in the past they have often been discouraged by the mathematical approach. Information science departments cannot simply open their conventional courses to humanities students; they must establish courses oriented toward the present and future needs of non-mathematical, non-scientific research. The non-mathematical uses of existing programming languages must be taught, and not only to humanities students. Programming languages like SNAP, which are intended for processing natural language and whose instructions are written in natural language, must be implemented at research computer centres, and must be taught in formal classes. Information science students must learn about the growing volume of solid computer-aided humanities research. They must learn which techniques have proven fruitful, and which ones have not. They must, above all, learn that the logic of computing does not require restriction to any single area, even to one as broad as mathematics. Data banks of literary, musical, and historical materials must be accessible for practice and for advanced research. Professors from established centres, such as the *Centro Nazionale Universitario di Calcolo Elettronico*, must be invited to lecture at other institutions. If all this happens, a new sub-discipline will evolve from its present state as the special interest of a small group of avant-gardists into an established and practical field of instruction and research, and information science will fulfil its potential as a pivotal science, central to all fields of intellectual endeavour.

It would be unfair to suggest that, like medieval philosophy, information science is deliberately limiting its horizon. There is, in fact, evidence to the contrary. Graduate students in the humanities are beginning to be sent to computer research centres for advanced training which they can bring back to their home institutions. Several associations, both in the computer world and in that of the humanities, have established special interest groups which unite the two disciplines: the Association for Computer Machinery, the American Society for Information Science, the Modern Language Association of America, the American Philological Society. Inter-disciplinary summer institutes have been held at the Universities of Kansas and Pisa. Numerous computers and humanities research centres are active: Cambridge, Liège, Nancy, Pisa, Paris, London, Edinburgh, Stockholm, Grenoble. At more and more national and international meetings, special sessions are being devoted to humanities instruction and research in and with computers. Among those held in the last year are the Jerusalem Conference on Information Technology, IFIP 71 in Ljubljana Yugoslavia, the annual Conference on Introducing the Computer into the Undergraduate Curricula (Dartmouth College), and the annual convention of the American Society for Information Science. All this activity is paralleled by a large number of individual papers read at other professional meetings and by several reputable journals and newsletters on both sides of the Atlantic.

As information science gains international esteem and establishes itself in university curricula, it will naturally attract growing numbers of interested scholars. The importance of humanities research can be to free it from identification with any single discipline, or any single approach. To the extent that this happens, information science will retain the essential ingredient of all science, the capacity to grow.

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PROBLEMS CONCERNING THE TRAINING AND FORMATION OF SPECIALISTS IN THE ELECTRONIC DATA PROCESSING SECTOR

by
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On the basis of long company experience in the sector of training EDP specialists the author refers to the « environmental » problem within which the training of these specialists must now take place. After outlining the characteristics of the curriculum for the training of EDP specialists, a possible structure for a typical course is suggested, ending with a note on the didactic methods used by Honeywell Information Systems Italy.

I. *Introduction*

The data processing industry has undergone enormous development in the last few years, and this has given rise to a growing demand for skilled personnel. The estimates now being made of the number of programmers, analysts and EDP managers that will be necessary in the coming years do not sufficiently indicate the range of the problem. This does not in fact consist solely in succeeding in training this quantity of people by suitable courses of instruction and in imparting given notions on specific techniques, but also in developing in them a certain aptitude and methodology of dealing with problems.

II. *Requisites of a training plan*

Let us consider the training requirements of an EDP specialist. They depend on the professional and educational background of the individual, on the ways in which he is brought into contact with data processing (appointment from outside, promotion from below, transfer from another sector of the firm), and on the type of job for which he is to be prepared.

Since requirements differ from individual to individual, training plans must be as personalized as possible, in order to adapt them to the individual capacities of understanding and assimilation. In all events they must be based mainly on the requisites envisaged for the job to be performed. By way of example, the requisites are listed for a job as systems analyst, on the basis of which, as will be seen, a standard curriculum of professional preparation may be arranged:

1. The analyst must be familiar with programming, and preferably have specific, personal experience in the field.
2. He must possess the techniques of systems design and analysis with special reference to the sources, collection and flow of data.
3. He must have a wide knowledge of the activity of the firm where he works.
4. He must know in detail the sector of the firm in which he is or will be working.
5. He must have a thorough knowledge of the possible applications of computers, and in particular he must have an up-to-date acquaintance with the most advanced applications in his specific sector of activity.
6. He must be sufficiently oriented computer-wise to be able to draw up clear specifications for subsequent programming phases. In given sectors, such as data transmission, his knowledge may have to be very thorough.
7. He must become a good interviewer, capable of dealing and working with other people. He must be capable of stimulating users of the computer services and of describing their real needs. He must be capable of identifying or condensing this information, assessing it and reporting on it to his management.

III. *Features of training curriculum for an EDP specialist*

The training of an EDP specialist cannot therefore be achieved solely using traditional educational instruments (participation in courses and seminars, study of manuals and specialist works, programmed learning texts, etc.), but is very closely dependent on appropriate practical working experience.

A training curriculum subdivided into the following three stages can thus be proposed:

A. Participation in courses which provide the person — supposed not to have any knowledge of this field — with the basic notions necessary for him to be inserted in operational activity, and for a more rapid assimilation of subsequent working experience.

B. Insertion in operational activity, at gradually higher levels, in relation to professional development, in order to acquire concrete experience to consolidate and complete his scholastic type formation.

C. Participation in further courses and seminars to guarantee constant updating and the fuller and more thorough specialization of the already trained specialist.

Three main areas may be pinpointed among the items providing the formation of the EDP specialist:

a. Processing techniques: hardware and software of the systems, program languages, organization and management of files, etc.

b. Problems of the major sectors of application of electronic computers.

c. Systems analysis and design methodologies: survey of procedures, feasibility studies, documentation standards, systems design, etc.

A standard curriculum should aim at satisfying requirements for Stage A, providing the basic knowledge for all three of the areas previously indicated in order to enable the person concerned to be inserted in the job at the lowest level, but autonomously.

IV. *Structure of a standard course*

A standard course can include the following modules:

1. Fundamentals of programming and organization of files.
2. Management techniques.
3. Analysis methods and techniques.
4. Analysis, programming and finalizing of an automated procedure.

The object of the first module consists in supplying the basic knowledge of a program language, of block diagram techniques and of the rudimentary principles of file layout.

In this stage, group work methods regarding special features of the EDP specialist's activity must be emphasized and made familiar.

The object of the second module is to provide the necessary knowledge of problems concerning the major areas of application of electronic computers, organizational structures and methods of quantitative analysis of phenomena affecting the firm.

The third module consists in illustrating the methodologies and techniques of analysis for surveying and designing an information system. With this experience of analysis, condensed into a relatively short period, participants should also acquire a general work methodology.

The fourth module aims at giving concrete experience, albeit in simplified form, of analysis and programming relative to an area of applications in the firm, and at making the EDP specialist aware of problems of interface between the analysis bases and the subsequent programming phase.

On the basis of the many years of experience possessed by Honeywell Information Systems Italia, we suggest a teaching methodology which aims at giving the trainee the maximum of responsibility. Hence, in order to involve him in the learning process in a rational and concrete manner, rather than emotively, and bearing in mind the didactic objectives and the structure of the course, it is advisable to alternate traditional teaching methods (lectures and lessons) and « active » didactic methods, such as group work, in such a way that the trainee learns by working with others, thereby experiencing the same situations that he will experience in actual work afterwards.

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THE CONTRIBUTION OF TECHNOLOGY TO THE CONSTRUCTION OF A NEW WAY OF TEACHING

by
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In the « knowledge society » the growing social demand for education must be met through personalized teaching/learning systems designed to prepare the student not merely to acquire facts, but to develop skills and capacity. The use of the computer makes possible the setting up in schools of « simulated laboratories » in which the student is able to gain experience of matters otherwise outside the range of his possible experience at school. Thus he is prepared to operate in a professional environment subject to very rapid evolution.

The society in which we live is characterized by a rapid and explosive development of knowledge. The transition period which we are going through justifies regarding our century as the initial moment of the new era of the « knowledge society ».

This revolution, comparable for significance and consequences to the industrial revolution, can be diagnosed and characterized by certain facts:

1. Scientific documents abound, the output of written information steadily increases.
2. Society's consumption is shifting from goods to services and the latter are becoming more and more complex.
3. In every sector the demand is constantly growing for increasingly skilled workmen.

In the « knowledge society » education will be open to ever widening strata of the population and at the same time, the period of the learning process itself will continue to grow to the point when a condition of « permanent » learning is reached, this being the inevitable consequence of the evolution of professions and the very rapid obsolescence of knowledge itself. Education is seeking ways of renewal. It is not a static reality. But, it does not succeed in keeping pace with the society. Education should contribute to the building of a new society. The updating and renewal of education has a meaning only if it is set in a context involving the whole society and its development.

This is the attitude of those who consider education as a productive investment and not as a service. Investments must have an aim and be planned within the framework of the adequate development of the country. And this must also be the case with the education, the vital propelling element of this development.

At this point I am in danger of embarking upon a discourse with remarkable political implications and of such vast dimensions as to take it outside of the subject of the conference.

On the other hand, I believe that this is less of a risk than being thought of as an extremist technologist: that is to say, a defender of the idea that technologies in themselves can offer contributions to teaching and research alike, independently of their way of use and the content that is transmitted by the technologies. After these remarks I want to be somewhat more technical, letting those competent to do so formulate the political considerations that must be the basis for the discourse on education and offering my contribution through a demonstration of the rôle the new technologies may play in a revised system.

The first contribution I wish to make is the opportunity offered by the new means of obtaining personalized didactic units. Doubtlessly this is a very remarkable fact, which allows us to face confidently and with prospects of success, the problem of mass-education in the twofold sense of providing for everybody and schooling in which conditioning due to different original environments operates.

The advantages of using didactic units that are personalized through a system of dynamic management of the study plans are several.

1. More effective teaching and greater attention among the pupils.
2. Opportunity for the explicit formulation of the aims of the course.
3. The perfecting of the methods for assessing the degree of learning which allows a continuous constructive revision of the teaching material depending upon its tested efficacy.

From what I have just said you will certainly understand that I am referring to Computer Managed Instruction and not to Programmed Instruction.

The mere introduction of individualized and dynamically modified teaching sequences may therefore make a significant contribution to the educational system.

Today's education is in fact defined by the course programmes and by the nature of the professions that can be seen at the end of the teaching cycles. Such a line of approach is completely wrong because it is based on the idea that the school must provide knowledge and notions instead of aptitude and skill. We should not lose sight of the idea that many children who start school in 1971 will probably work in professions that are still unknown today. The school must be of particular service to them if it is to build tomorrow's society. And even where professions do exist today and have been in existence for some time the students that enter them tomorrow must be prepared to operate in an environment in which knowledge must be updated continuously. This implies the necessity of superseding a dogmatic way of teaching in which the sciences are presented as if they were definitive and of unchangeable certainty.

The experimental method and the preparation of youth to meet the demands of future and currently unforeseeable progress and a total upheaval in our present knowledge will produce a critical attitude and creative behaviour instead of creating a suspicious barrier of uncertainty towards innovations, discoveries and changes.

In such a view it is possible to find a precise rôle for the new technologies. From this arise two other significant factors governing their use:

1. The necessity of not alienating the school from society. The latter has an increasing technological content. I believe that this will pour into the school at a higher rate than in the case of Gutenberg's invention, which took about four centuries before it began to fulfil a rôle in teaching, which it radically altered.
2. The new meaningful didactic message which can be transmitted through them; I refer to the possibility of building up didactic systems that will interact and evolve and to the introduction on a large scale of the method of experiment and simulation.

In addition to the criterion of personalizing the study plans, which is derived from a transposition of Programmed Instruction to the computers, interesting vistas are opening up today involving a highly specific and effective use of the computer, while not requiring any practical initiation in Computer Science.

Nowdays it is possible to operate with the computer through subsets of natural languages and through the use of languages able to interpret and carry out mathematical algorithms without needing further programming.

In this way there is even greater possibility for the direct use of the computer: the terminal becomes a laboratory of astounding versatility and the language used in the dialogue contributes to the formalization and comprehension of the material employed.

Complex experimental and operative situations can be simulated through the use of such laboratories, by helping to reduce the dangerous gap between themes constituting subjects of discussion in the school and the problems present in professions.

Conclusions

A down-to-earth and moderately contained approach will enable us to look at the problems realistically.

New technologies can effectively make remarkable contributions if they are used judiciously, with strong motivations and precise aims.

The level of technologies will be further developed, offering increasingly economical and effective means, but even now many things can be achieved.

In fact, there appears a significant possibility of being able to advance towards individualized systems just as the number of students and the length of their study plans are increasing.

Equally remarkable is the prospect of reducing the gap between problems solved in school and real problems faced in the professions. But what is perhaps more revolutionary and innovatory is the possibility of having at one's disposal a new teaching style in which the student is led to experiment and discover, thus preparing himself in a highly effective way for his introduction into a future professional life, in which, if he is not research-minded and disposed to accept changes, he will very soon find himself obsolete and alienated.

The school can therefore hope to find a significant help in the technological fall-out that pervades every sector of our society. It is chiefly the task of teachers and pedagogues to ensure that technology for the school is accompanied by actual benefit and profitable renewal.

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THE PRINCIPLES OF THE TRAINING OF INFORMATION SPECIALISTS

by
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Warsaw

The paper shows the fundamental differences existing between the qualification of a librarian and those of an information specialist.

Stress is laid on the fact that the training of various vocational groups of information services personnel has to be treated separately according to each specific group. Four groups are indicated: technicians, analysts, semanticists and systems engineers. The functions performed by each group are discussed, and training principles for the 4 categories suggested.

The system of education of scientific and technical information personnel plays a considerable rôle in the work of organizing an efficient information service which can supply industry and science with up-to-date, complete and trustworthy information. It is therefore understandable that this problem is at the centre of interest of those concerned with the relatively new field of knowledge — information science.

During their studies people who are to work in information storage and retrieval systems should acquire the appropriate knowledge and habits necessary to carry out the particular operations within the system. This system — by which we mean the whole of operations, methods, principles of organization and programming, and the elements necessary for input, processing and output of a particular piece of information — comprises a number of operations such as: acquisition, storage, processing, indexing, searching, dissemination, and so on. All these operations, or at least most of them, have been known to librarians and archivists for a long time. Also, such operations are carried out daily in all establishments which have collections of documents. Therefore, before we continue our deliberations we should determine the nature of the basic difference between the long-standing operations carried out in libraries, archives, etc., and the operations carried out in modern information systems so as to define the differences in the qualifications required of information service personnel as compared to library science graduates.

It seems that the essence of this problem is that, in contrast to librarianship, there is not and there cannot be a « universal » profession of information specialist. The employees who work concomitantly in an information system represent many professions in the group of technical personnel directly operating the various apparatus of the system, as well as in the group of scientific officers carrying out logical operations connected with the working of the system.

All the employees who operate the equipment will be classified in the technician group. Thus typists, varitypists, shorthand typists copying processed information, operating telexes, or serving at conferences, xerography technicians, operators of offset presses or electronic computers, programmers, etc., will come in the above category. It is not really necessary to train such personnel in the field of information because it would not make any sense to teach a photo-laboratory technician the basics of a retrieval language. Such personnel should consist of appropriate branch specialists, who have perhaps attended a short (two - three days) general course dealing with the aims and tasks of information activities and possibly including an explanation of certain formal requirements connected with the technical handling of texts (e. g. typists copying abstracts should be acquainted with the used abbreviations of periodicals, etc.). Out of this group only the programmers should be treated differently. They should undergo detailed training, but specially planned for them, in the field of information systems. This is a completely different problem since the number of specialists required is relatively small and their training depends on the planned equipment [1].

On the other hand, the scientific officer group can be divided into the following three specialist sub-groups requiring different training programmes:

a. Analysts (compilers of abstracts) who condense the information contained in handled documents, present it as a summary (abstracts, synopses etc.) and determine the keywords (any characteristic words in the natural language).

b. Semanticists who translate the selected keywords into the retrieval language, conduct scientific and literary editing of abstracts, enter the information from documents into the storage, translate information inquiries (of users) into the retrieval language, carry out searching and all the other scientific tasks connected with efficient working of the information system.

c. Systems engineers who organize information systems. They should be able to accomplish the following:

— on the basis of studies of information needs conducted by the modern methods of operational research they should determine an optimum form of user servicing for a planned or working system (selective dissemination of information, current awareness information service, information system for individual users) and an optimum form of disseminated information (analytical or subject surveys, abstract journals, abstract cards, translations, and so on);

- on the basis of information flow studies they should determine the most useful and economical carrier of information and, therefore, the necessary equipment (from punchcard files to computers);
- on the basis of the specific properties of the information system and the selected information carrier they should determine the most appropriate retrieval language;
- they should determine the size and subject matter of the book stock, and the period during which information becomes obsolete;
- they should establish the number and qualifications of the permanent staff and outside collaborators;
- etc.

Bearing in mind the above division of information personnel and the scope of their functions, it seems that the training of these groups should be similar to that described below.

Analysts. They should be specialists highly qualified in the respective fields. Their preparation for the purposes of information should be limited to acquainting them with the rules of correct summarizing, the style of abstracts and certain formal requirements demanded of abstracts and keywords in a given information system. The best form of training would be of a seminar type.

Semanticists. They also should be university or college graduates in fields connected with the topics of information activities. However, in contrast to analysts they are on the permanent staff of information systems. Primarily their training should include the following: editing of abstracts (preparation of bibliographical entries, scientific and literary editing of abstracts, proof of the set of keywords chosen by the analyst) and retrieval languages with a particular stress on the language applied in the given system. Thus the training of semanticists should include a full and detailed description of all the operations of the information process (collecting and storage, classifying, searching, and so on), the methods used to carry out these operations, organizational forms and legal bills connected with information activities and user servicing. The training programme should also include the theoretical subjects necessary for a deeper understanding of particular operations: logic, psychology, sociology, linguistic science, communication theory, set and probability theories, intellectual work techniques, and so on. Finally, bearing in mind the leading and inspiring rôle of semanticists and, above all, remembering that in the most progressive servicing mode of information systems, i. e. selective dissemination of information, it is the semanticist who decides whether to send a given piece of information to the user or to reject it, one should make arrangements for lectures in their field thus making them aware of the latest research trends, industrial needs, and current obstacles and unsolved problems. The editing of abstracts is covered by a separate group of subjects. Style and form are primarily involved here. Lectures improving the mastery of foreign languages are also advisable. Semanticists should also be acquainted with the tools used in information systems to such extent as is necessary to undertake co-operation with the technical staff, e. g. programmers. It seems that the most appropriate forms of training of semanticists are one and a half to two year correspondence courses or evening classes organized (as has already been mentioned) for specialists in a given field who want to make their careers in information.

Systems Engineers. Bearing in mind the scope of their duties and activities specified above we can state that they should be specialists having appropriate personal traits, possessing a sound knowledge of information systems and systems engineering, acquainted with modern analytical techniques. Post-graduate courses are suggested as the best form of training. Let us now recall the intellectual attributes that a systems engineer should possess. These are the ability to comprehend problems as parts of a system, to appraise various phenomena sensibly but quite objectively, good imagination, and organizational abilities. A person who does not possess the above personal attributes cannot become a systems engineer. It is for this reason that graduates of virtually any higher education establishment who have had experience in information can apply for a post-graduate information course. A psychological test determining the above-mentioned personal attributes is suggested instead of an entrance examination. The syllabus of such a post-graduate course should comprise the following three groups of subjects: theoretical subjects (mathematics, cybernetics, logic, psychology, sociology, linguistic science, statistics, etc.) information and library subjects (retrieval languages, machines and devices, organization of information activities, and so on) and subjects connected with systems engineering decision theory, queueing theory, computer simulation methods, elements of analytical techniques, management and supervision methods, etc.). Summarizing all that has been written above we can repeat once more that in contrast to librarianship which is a profession « as such », there is no « information profession ». The personnel of information systems consist of people of many different professions who have undergone a short preparation for information jobs (technicians, analysts) or have been trained to utilize their professional knowledge to the maximum advantage to the information service and, through it, science and industry.

Thus the point is missed when talking « in general » about training, syllabuses and forms of teaching of information service personnel without specifying the profession of the information service employees under discussion and, in the case of sematicists, the field of knowledge.

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Olgierd Ungurian was born in Warsaw on 19.5.1972. He took a M. Sc. Engineering Degree at the Institute of Technology, Gorki - USSR, in 1963. He was Head of the Classification Department, CIINTE (Poland) from 1963-1967 and chief editor of the Polish Edition of the UDC from 1963-67. Since 1967 he has been an affiliate member of FID. In 1968 he was appointed Lecturer in Retrieval Language (Training System for Information Work of CIINTE and the Polish Scientific Academy and Post-graduate School for Information Work, University of Warsaw). He is the author of an « *Introduction to the UDC* » (FID publ. Nr. 409) and some other text books for students (in Polish).

SIX YEARS EXPERIENCE IN THE TRAINING OF INFORMATION OFFICERS THROUGH SHORT SESSIONS AND UNIVERSITY COURSES

by
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Besides its activities in organizing and implementing information and documentation systems, since 1963 the Bureau Marcel van Dijk has held more than 55 one to five day training sessions, for a total of 4,000 man days attendened by more than 1,350 persons coming mainly from private companies, public services and university libraries. A description is given of the Bureau's general algorithmic improvement programme for documentalists, which combines initiation, training and improvement and includes a high percentage of practical exercises. Remarks arising in the final evalutation of the courses and from the experience of the lectures are summarized.

My purpose here is to give an account of an experience which relates in particular to the provision of short training courses — usually from two to five days — orientated either to an *introduction* to the methods and techniques of documentation or, at more advanced levels to *improvement*, through a systematic methodological approach, on the one hand, and various group exercises on the other.

As a specialized organization in the field of documentation we have, in particular since 1963, visited and investigated more than three hundred documentation centres in Europe and the USA, participated in more than twenty congresses and international conferences and published about twelve articles in professional journals and three important books sold through normal bookshop channels.

The rapid sensitizing of the scientific and industrial spheres to information problems came home to us, as early as 1963, when we organized an 'information day', without much publicity. Although an attendance fee had to be paid more than one hundred and fifty people took part.

A few months later we began our training work in the form of study days, seminars, improvement courses and ultimately, even courses at university level.

To date the number of participants has been approximately one thousand three hundred people and the equivalent of four thousand man/days attendance, during fifty-five sessions of one to five days.

We eventually diversified our programmes: starting from one-day sessions essentially conceived for the introduction of new documentation methods and techniques, we have since 1965, introduced a two-day seminar on « How to set up and develop a documentation service ».

Since 1968, in co-operation with INSEAD in Fontainebleau, we have offered five-day programmes focused on the improvement of documentalists and librarians. These programmes include a lot of practical exercises: abstracting, thesauri building, various types of representation in the Computer Age » which also deals with data banks. To conries of complete texts, consistence appraisal etc.

In 1971 we introduced a new three-day seminar on « Documentation of vocabularies, the use of thesauri, indexing from titles, summaclude, in 1969 and 1970 we held courses at the universities of Buenos Aires and La Plata (Argentina) on « Automation in Documentation ».

In a parallel direction each a year, on the occasion of the Office Organization and Material Fairs (SICOB in Paris, the Mechanography Fair in Brussels, the Lisbon Fair) we organize three-day sessions focused on the selection of repography material.

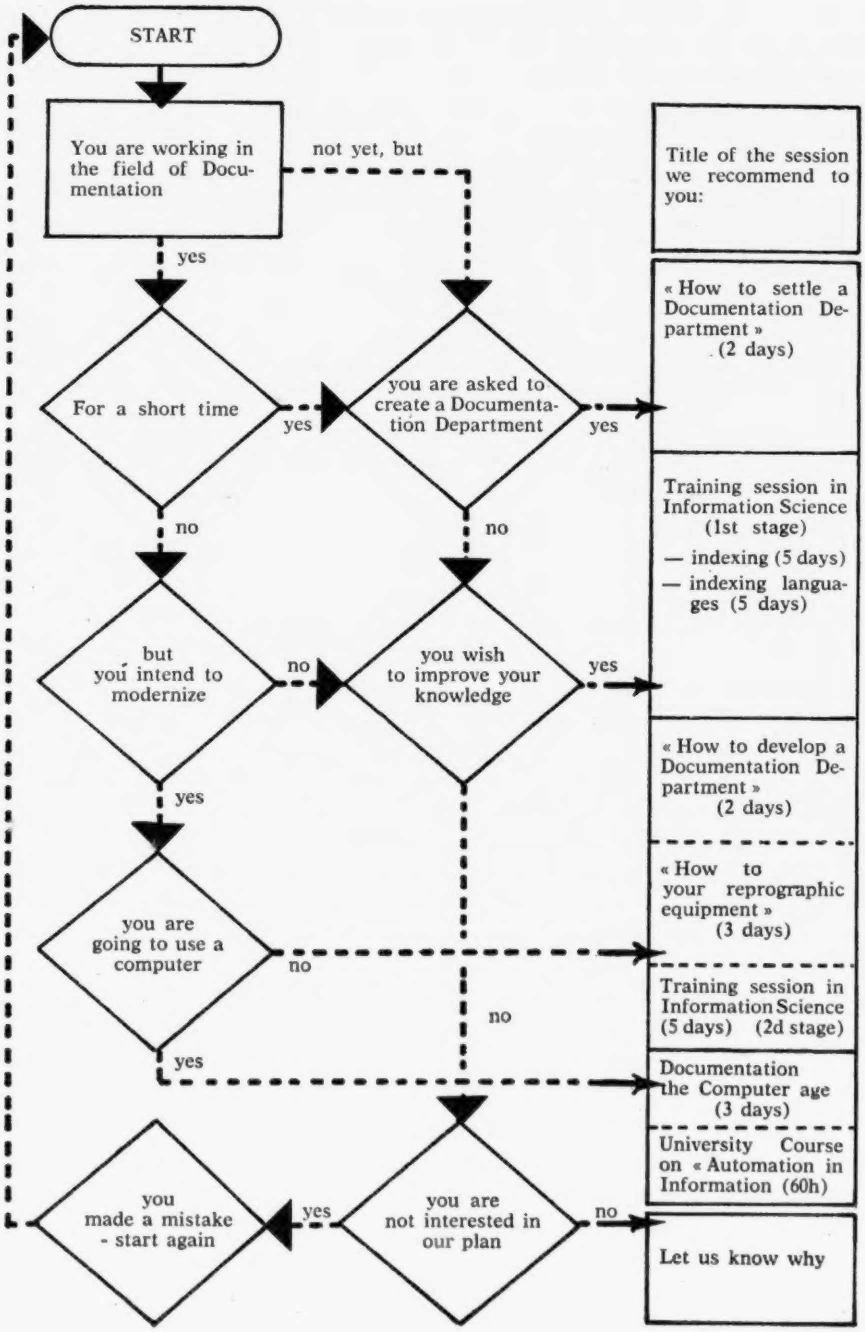
These seminars are integrated in an improvement plan shown schematically in the diagram on the following page.

The time we have been alloted does not enable us to discuss these programmes in detail. At the conference itself though, leaflets will be available for any one interested in them.

We would like to draw your attention to several observations:

1. Most of the sessions that we give are organized by institutions in which documentation is not an essential concern, that is to say the national members of the International Council of Scientific Organizations (CIOS) such as CNBOS in Belgium, CNOF in France, ADOST in French Switzerland and IDEA in Argentina. Others are employer's organizations such as COPRAI in Portugal or teaching establishments such as INSEAD at Fontainebleau (France) and lastly Official organizations. Consequently most of our courses are given to members of different companies which gives them a very heterogeneous character as regards the participants.

The lack of homogenity is very clear at the outset of the courses as regards the participants' level of knowledge and experience, responsibility, the size of their firms or institutions, the degree of development of the documentation function within the company, and by the preoccupations related to their sector: engineering, economy, teaching. With the object of remedying this heterogeneity as regards the participants, we have created our improvement plan, whose algorithmic con-


START
You are working in the field of Documentation
not yet, but
yes
Title of the session we recommend to you:
For a short time
yes
you are asked to create a Documentation Department
yes
« How to settle a Documentation Department » (2 days)
no
no
Training session in Information Science (1st stage)
— indexing (5 days)
— indexing languages (5 days)
but you intend to modernize
no
you wish to improve your knowledge
yes
yes
« How to develop a Documentation Department » (2 days)
« How to your reprographic equipment » (3 days)
you are going to use a computer
no
no
Training session in Information Science (5 days) (2d stage)
yes
Documentation the Computer age (3 days)
University Course on « Automation in Information (60h)
you made a mistake - start again
yes
you are not interested in our plan
no
Let us know why

ception is intended to guide documentalists to the section most useful for them.

2. The analysis of the level of responsibility of the participants within their firms, reveals that nearly ninety per cent of them have no managerial responsibilities in the documentation centre. This fact is in general related to the half-hearted response accorded to information problems in firms throughout the world, except for a few very large ones. Generally speaking the participants have « occupational » problems on their hands and are seeking the ways and means of solving their own particular ones. We personally know of the case of a documentalist who took an active and successful part in a five-day session, but who had, in fact attended, mainly because she was hoping to learn what was the most appropriate standard for classifying cards in an alphabetical card-index.

3. The study of the written questionnaire returned two weeks after the session confirms that one of the observations that arises most frequently in the final evaluation period is: « At last I've met colleagues who have the same difficulties that I have and with whom I have had the opportunity of exchanging ideas for the practical solution of some of my problems ». This kind of remark reveals the extreme isolation of most documentalists inside their companies. Eighty per cent of the participants are entirely unaware of the national and, even more, the international organizations for documentation, the journals dealing with information and documentation problems and the documentation and information centres open to the public even within the area of their own specialization not to mention those of other countries.

The majority have never heard of the Clearinghouse (now the National Technical Information Service) in Springfield, nor the European Translation Centre at Delft.

This being so, it is not surprising that so few of those responsible for documentation services are interested in the evaluation of the cost/effectiveness ratio of their activities. Most of them try to obtain budgets and personnel — often inadequate — and confine themselves to the mere answering of queries. Very few forecast the needs of users or try to « sell » information. Are they, in fact, really convinced of the « value » of the service they offer? A more precise idea of that value should not only help their morale but also provide valuable help in their effort to wring more judicious and generous budgets from an unwilling management.

4. To meet these various yet constant characteristics of our students, we have learnt from experience that the most reliable division of the course time appears to be twenty-five per cent for the methodo-

logical and general aspects and seventy-five per cent for the practical aspects, divided as follows:

— five per cent for the first round table gathering
  This is essential in order to:
— enable the participants to get to know each other, to establish their relationships with one another, to facilitate contacts and break the ice by obliging everyone to speak, that is to say, by assisting them to free themselves of the factors which inhibit them from taking an active part in the discussions and eventually also to reveal some personal cases.
— Enable the givers of the course to adapt the content of their lectures and the kind of exercises to the pre-occupations and needs of the group.
— Thirty per cent for practical exercises
— Ten per cent for the final question time.

Although the whole session is conducted on an essentially participatory basis, the question period is one of the most crucial moments in the seminar. The way the course givers have answered the queries usually indicates whether a participant has learned something or not.

There must also be time for criticism which most often is of two kinds:

— the duration of the seminar is always considered too short even if if it was a five-day one and even if, being residential, it allows many more hours for discussions as well as working time:
  — many more exercises are called for without in any way admitting a reduction of the the lesson time.

This is very encouraging insofar as it shows that the participants are interested and wish to learn more.

The interest shown is revealed in two ways:

— quite a large number of participants attend other seminars in order to improve their skills;
— from 1971 we have been organizing in Paris evening Round Table discussions of two to three hours duration. To these we invite participants of previous sessions, selected from a particular field (for example chemistry).

The invitation mentions that the aim of the meeting is « to make a synthesis of the modifications which have arisen in your documentation service as a result of the information knowledge acquired during the seminar which you have attended ».

We have been surprised to see, at the first of these Round Table Discussions that the participants:

- were all responsible *for* documentation at a relatively high level;
- had come to complete their knowledge rather than survey it;
- engaged in discussion — of three hours duration — on problems relating to the documentary structure of the Company, the methods by which documentation could take a better place in the complex of the firm's activities and approach techniques focused on the marketing of documentary services etc.

The above-mentioned problems are in fact very difficult to handle during ordinary sessions due to the heterogeneity of the participants and of their interest in operational tasks.

Conclusion

We are convinced that one of the interesting factors of our seminars is precisely because they take place entirely outside the institutions where documentation is traditionally taught. Although the number of participants that have attended the documentation courses is quite large, our courses are attended by a considerable proportion of documentalists who entered this field very often quite accidently, and who are devoted to it, but have neither the time nor means to spend many hours during the day or in the evening on specialized learning.

Many of them were familiar with our book before attending one of our seminars.

We think that within the the framework of permanent education, very flexible structures for systematic teaching should be introduced in order to enable those interested to acquire, at the right time, the necessary knowledge for the development of their professional activities.

Your attendance at this conference makes clear that there is work to be done.

In the meantime, we must devote all our efforts to supplying the documentalists at work — above all the most isolated of them — with the means to make the most of themselves and to fulfil their task — which often holds more for the future than they themselves believe.

And this is the purpose that we believe is effectively fulfilled by our activity.

MARCEL VAN DIJK was born in 1917. He took a Mining Engineer-Architect Degree in 1940 at Brussels University. For five years he worked in coal mines followed by five years in the Personnel and Management Department of a worldwide firm. For more than 22 years he has been a management consultant, the last 13 as Chairman of his own firm. Within the sphere of management consultancy, the Bureau Marcel van Dijk has developed a highly specialized Documentation Consultant Department. As a documentation consultant, the Bureau has been an affiliate member of FID since 1963, and this worldwide activity gave it the opportunity to take an active part in most of the international conferences on Information Storage and Retrieval in the last ten years.

PREPARING FOR CERTIFICATES FOR INFORMATION SCIENCE

by
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It is argued that informatics is more than computer information: applied informatics must cover human aspects of information, collaborating with psychologists and sociologists. Fundamental informatics must encompass the « system » concept and thus enter areas hitherto not associated with computer users. The reasons for the danger of the information scientists isolation and dangers of isolation in education and professional work are indicated and the need emphasized for a sound theoretical basis to initial training. The many common points between information science and informatics are listed and the advantages of the modular structure for information certificates described: improved quality of education and adaptation to needs, organization advantages, reduced costs, standardization of contents and levels of examination. The future computer situation and the training needs for the necessary manpower to meet this are surveyed. Stressing the necessity and benefits of collaboration in the field, the paper ends with a reference to the proposal for a Co-ordinating System for Non-Governmental International Bodies dealing with Informatics *recently put forward by the Intergovernmental Bureau for Informatics.*

Information Science

Preparing for a short presentation at this INI Conference I have read with great interest the Opinion Paper by Glynn Harmon[1] which represents a good history of the field of documentation since 1945 to date. I may quote the first lines of his conclusions: « Information science appears to have emerged not only as an expansion and metamorphosis of documentation and information retrieval; it directly or indirectly incorporated or paralleled several prevailing objectives and concepts of the communication and behavioural sciences and other contributory disciplines ».

Informatics is more than Computer Utilization

At a recently organized symposium, A.A. Verrijin Stuart[2] defined the concept of « informatics » and he warned his audience that quite often: « informatics is defined as the science concerned with the problems of computers and processing by means of machines » which includes the danger of suggesting a science fiction like technology, which is only justified if it includes the man-machine relation completely. In practically no situation is a human being communicating with a computer. Sometimes he is trying to get an answer on a specific question, like in an information retrieval system. But then, he is using an existing « information-network » designed by other human beings. Thus he concluded that:

a. applied informatics is compelled to co-operate with psychologists and sociologists and to consider the human aspects of automation as an essential part of the discipline;

b. the fundamental informatics must also deal with the « system » concept and thus enter as well those disciplines and areas which so far were not associated with computer users, and therefore left to the application practitioners.

Since 1967, when the International Federation for Information Processing, IFIP, approved the constitution of its subset: the IFIP Administrative Data Processing Group, IAG[1], the term 'business data processing' has generally been replaced by the more exact term 'administrative information processing'. The field of the documentation and information science, and especially information retrieval, can be considered to be administrative data processing. The explosive development in this application area, even only the registration of books and articles is of such a size, that it is euphemistic to talk about a problem area.

The computer has indeed in some cases given some start to a solution of the problems, but the battle against the huge quantity of printed material has not been overcome, as it has not in our offices. In the libraries and documentation centres it will be necessary to revise methods, techniques and thus systems as well before the computer can bring any relief.

The conclusion can be that there is less difference between « scientific computing » and « administrative data processing ».

Dangers of Isolation

There are some reasons which, also for the information scientist, may count to be so important as to make him feel he is working in a very specific technical-scientific area. Three reasons of this type may be considered:

a. technical and scientific *knowledge* is required to formulate and evaluate the problems in this area;

b. the *problems* often present themselves in an isolated form, they are strongly linked with the specific profession, and they concern the tasks of only a few persons or smaller teams. Larger groups are only interested in the results, they are not co-responsible for all elements of the information network;

c. there is a *tradition of independence;* the creative element of research and development is by its nature a good reason for the researchers and designers also to work isolated from others.

These three aspects — knowledge, problems and tradition of the specialists — have led to an isolation which indeed carries dangers with it.

Isolation in Education and in Professional Work

Isolation may be promoted by education as well as by the future professional work. A reproduction-mechanism of, for instance, « computer scientists » can easily be recognized. An exceptional case is the final draft of the ACM curriculum committee for Computer Education for Management by Professor Dan. Teichroew[4] and others.

Isolation in professional work can be a tradition, but I assume that this also is a displaced tradition for « information scientists ».

A view with perspective

D.J. Foskett[5] presented a statement at an ASLIB Evening Meeting this year which stresses very strongly the viewpoints given earlier. He says: « In such circumstances (the rapidity with which the professional scene is actually changing today) it seems to me to be absolutely vital that those who are going to be in charge of affairs in ten or twenty years' time must, at this stage, be bringing a sound theoretical approach to the analysis of problems, rather than tackling them in a purely pragmatic, or « bull-at-a-gate » manner.

In my view, the history of the application of computers to library and information services is one long trail of disasters; after twenty years, we have only just arrived at the stage when we can honestly say that there are systems available that are really worth adopting. Yet the professional literature is full of accounts of this, that, or the other system which purports to have found the answer. It is therefore in the immediate interests of both student and the profession that the initial course should consist of a sound theoretical training; I suggest, furthermore, that it is in the not-too-long term interests of the employers also, though it will inevitably mean that they will have to devote more time to practical instruction when the newcomer arrives ».

The last words by Foskett were repeated at the same session by W.L. Saunders[5] when he said that « the practical experience element is gained by 'in-service' training in library and information units ».

I am afraid that -- though I have been careful in the above part of this paper — I cannot agree more with Professor Saunders when he states that « the employer who expects the library schools to produce for him 'instant' cataloguers, 'instant' computer programmers, 'instant' abstractors, is likely to be disappointed ». But instead of concluding thus for a need or a plea to begin at once with some plain education as to modern systems, methods and techniques, he feels that « the employer himself has to make his own indispensable contribution, to provide the on-the-job training element ».

Certificates in Informatics

Having been responsible for a national institution for education in informatics, I had originally intended to present a survey of certificates[6] as implemented in the Netherlands, because I believe that this is an example of a feasible and efficient approach to arranging the education and training through a modular approach.

There are indeed many aspects which education for Information Science and for Informatics have in common. To those in charge of education I greatly recommend this brochure.

Our common problems are, amongst others:

a. need for well educated and trained staff;

b. need for sufficient experts, specialized teachers, course co-ordinators and examiners;

c. need for a flexible (therefore 'modular') curriculum, to replace or update the parts of the curriculum which are becoming obsolete and out of date;

d. need for course material and handbooks

e. need to reduce, in spite of the increase of the total amount of work to be done and efforts to be made, the cost factor.

The possibilities of the Modular Structure

The possibilities and advantages of education modules are, for instance apparent in:

a. improved quality of education

b. improved adaptation of needs

c. organization advantages

d. reduced costs

e. standardization of contents and level of examinations.

Situation to come

The number of computers in the world is approximately 100,000, but this does not mean the end. More than about computers and the increase of computers — also applied in libraries and documentation centres — we all should feel concerned about the people, because computer applications require operators, programmers, systems designers and information specialists. But in addition to this immense number of computer professionals, we should even feel much more concerned about a much larger group, possibly for the moment still diffuse group, of 'computer users'.

In his opening address at the First World Conference on Computer Education, the IFIP President, H. Zemanek[7], pointed out the following factors which are important from a quantitative aspect of the problem:

a. the increase of the number of computers is thirty per cent a year, i.e. the number doubles every three years, and multiplies every ten years;

b. it is to be expected that all countries will ultimately reach the American computer density of 1970, namely 60,000 computers for every 200 million persons.

On the qualitative aspects Zemanek remarked:

> « In our days of particular saturation and general interdependence the growth of a new field depends on the influx of good people: specialists, researchers, teachers and the many people simply working in the field either in their main profession or as temporary users.
>
> Only an excellent education can attract and yield all those people necessary for the advance of the new field. The problem is that the usual courses: university, high school and professional, essentially require a certain period of development before they can offer the appropriate education. The computer, on the other hand, is developing very fast and cannot afford classical delays ».

CO-OPERATION IS NOT AN UTOPIA, BUT A NECESSITY

Last year, about this time, the fifth General Assembly was held, here in Rome, of the Intergovernmental Bureau for Informatics, the former ICC, and the Director, F.A. Bernasconi, presented a proposal for « *A Co-ordinating System for Non-Governmental International Bodies dealing with Informatics* »[8].

In the document, which was approved by its General Assembly, the IBI stated that it is offering to non-governmental international bodies dealing with Informatics the possibility of establishing a common Secretariat, not as an association, but a Secretarial Organization from which the joining members obtain some services for which they have to comply with certain rules.

The *basis characteristics* of the proposed system can be summarized as a co-ordinating system on a voluntary basis, in which each joining member will continue to operate along its usual lines and organization structure.

A *Co-ordinating Council* will consist of one representative of each Joining Member. The co-ordinating council will meet twice a year, inform/co-ordinate the activities of the Joining Members, and make recommendations to IBI about those activities of the Joining Members that could be conveniently supported by IBI and/or UNESCO.

I leave it to the prospective Joining Members of the possible IBI-Co-ordinating Systems, which certainly can be sure of UNESCO's support, to imagine how much could be achieved in common and concerted actions between, for instance, IFIP, IFAC, FID, IFORS, IMEKO and some others.

Though each of the afore-mentioned organizations now has its own working domain and authority, there would at least be one area — but everybody knows that there are more — where communication and co-operation would be of great benefit to the information utilizing world.

What is indeed of importance in the planning for future education about information science and informatics — as well as in using these (the large numbers!) — is to take a realistc as well as an open-minded view on the possibilities that lie ahead of us.

Let me conclude and quote B. Langefors: « In Education — the shaping of the future — it is of the utmost importance to understand that realistic planning does not mean conservative planning ».

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Mr. A. A. M. Veenhuis, born in 1928, studied psychology at the University of Nymegen and worked until 1960 at the Hoogsveld Instituut, a centre for applied research in the area of educational psychology. He then joined the Netherlands Information Processing Research Centre (Studiecentrum voor Informatica) in Amsterdam and was in charge of the Education Department. From 1967 he was General Manager of the IFIP Administrative Data Processing Group (IAG). In the meantime he acted as consultant as regards other educational projects of IFIP and IBI-ICC, Rome for developing countries.

ON SOME PROBLEMS OF SYSTEM-SYSTEM INTERACTION AND TRAINING CONCEPT

by
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In developing informtion systems for science and technology a closer interaction between different information modules is assumed according to the differentiated needs of various decision levels. The author suggests that these new trends should be included in the training and educational programmes, some of which are described in the paper. Stress is given to the need for determining the social, technical, economic and cultural balance of the information programme in each given environment.

The state's requirements for new, specialized, condensed and complex information output according to the differentiated needs of various decision levels bring complicated problems in information system design and realization. The concept of training of information personnel is closely connected with these new trends. It has to take into consideration the following:

1. A state information system consists of definable information modules /A... N/ with different intensity of mutual interaction from the point of view of their functions and various decision levels as well with the intention of attaining step by step effective control of the main information flows in the given environment according to the defined need.

2. From the system point of view the management process is considered as a flow of information. This permanent, aim-oriented flow of information (for knowledge's sake and for decision's sake) moves vertically from top levels to lower levels and back, and in horizontal directions between decision centres of the same level. If the given decision level receives the optimal information in quantity and quality needed for decision (no more and no less) it can be said that the information system corresponds to the given model of the management system. It is supposed that the

quality of an information system, its theoretical and practical capability influences the quality of decision.

3. Scientific, technical and economic information form one of the basic modules of the state information system. They must interact internationally with the scientific, technical and economic information systems abroad.

   — One of their main functions is to communicate STEI internationally. However they must interact with other information systems within the state (social-economic, planning information ecc.). The need to integrate arises from the requirement to produce complex information according to the needs of different decision levels (within an enterprise, set of enterprises, branch, central level, ecc.).

   The training must be profiled modularly to make it possible:

- to project precisely the differentiated information needs of the users in different decision levels;
- to intensify analytical and synthetical studies of the state-of-art-type etc. especially of an interdisciplinary character;
- to form new information types and structures which must be developed by programming the interaction of information modules in different decision levels. The integration principle is based on the ability to reduce or to constitute information flows either within the given information module or by combining information of different modules not only of one level, but even for special cases by selecting and processing information at different levels and modules;
- to build system structure of data banks at different levels of basic type and derivative type, monotype and hybrid type within the modules and state information system as a whole;
- to form system-system interaction of different information flow intensity on international level.

We think three types of approach to solve the problem might be considered:

1. To project the education programme within the programme for the rationalization of information system, for example, in the CSSR the research for education of information personnel and users is a part of the programme « State information policy in

scientific and technical development »[1] and takes into consideration the following problems;

- — training profiles and types of education programmes;
- — methodology of education according the types of schools;
- — post-graduate training;
- — training of scientific personnel;
- — system of training programmes (secondary schools, adult education, users training ecc.);

2. to formulate a co-operative programme for training in all information modules within the state in order to create a modular construction of training profiles according the different needs;

3. to use prediction methodology in system design concept so as to compare long-term trends and aims in information system development with the training profiles in present use and to develop them proportionally according to the supposed requirements of society.

The aim is a coordinated development of an affective information system with well-defined differentiation of functions according to the needs of the national economy and society as well, where social, technical, economic and cultural factors must be balanced.

We think, that the requirements of society as regards information types and structures are beyond our present means in the given stage of training development. For this reason, international cooperation in training concept is of a great importance: different types of pilot projects, applied in different countries and evaluated according to a given stage of development.

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Dr. Anna Vejsová, PHDR, CSc was born at Plezn (Czechoslovakia) in 1925. She attented Charles University, Philosophical Faculty from 1945-50 and 1967-71. She took a state exam in librarianship in 1949 and a doctorship in English literature, aesthetics and philosophy (1950). She followed various computer application courses from 1963-69 and took a first scientific degree in Logics. She was Head Librarian of the Philosphical Faculty, Charles University from 1950-51. She is now Head librarian for Methods and Technology in STEI at the State Technical Library, later the Centre for Scientific, Tecnical and Economic Information, Prague. From 1962-70 She was engaged on experimental research on punch cards and computer application in STEI and published the results in various articles. She is now engaged on research on information macro-system design and lectures on STEI.

REPORT ON PRACTICAL EXPERIENCE OF TWO SWEDISH COURSES FOR ACTIVE INFORMATION SPECIALISTS WITHOUT FORMAL TRAINING IN I & D

by
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Sinfdok, the Swedish Council for Scientific Information and Documentation, has arranged a post-graduate course for qualified personnel newly employed in special libraries and documentation centres. Teaching has been in the form of a sandwich course. The course is intended for the service-oriented type of information specialists with a good subject knowledge. It has been specially designed to serve industrial needs.

There is not yet any regular university education in the field of Information and Documentation (I & D) in Sweden.

The Swedish Council for Scientific Information and Documentation, SINFDOK, is the central Swedish organization for scientific and technical information and documentation. SINFDOK arranged a post-graduate course on I & D during 1969/70. The course was repeated during 1970/71, and a third course is in progress now, 1971/72. The students have been qualified personnel newly employed in special libraries and documentation centres and science graduates or engineers wishing to enter the profession. The courses have been specially designed to serve industrial needs.

Guidelines have been drawn up by an expert committee and administration has been carried out by SINFDOK personnel. The teachers have been experts active in I & D-work.

Teaching has been in the form of a sandwich course, three days at a time at intervals of three weeks. There has been a total of two hundred hours of instruction.

The syllabus comprises the organization of I & D in Sweden and international co-operation in the field, how to organize an internal information service with special regard to the information needs of various user categories, how to find and use different kinds of information sources, manual and computer-based methods of information storage and retrieval, and the principles of written and oral communication of information.

Thirty students have been accepted for each course. They have been chosen out of more than double the amount of persons wishing to attend them. Most of the already active information specialists have been accepted, provided they have had a good background education. Out of those without experience only a few well qualified students have been allowed to take part.

The courses have been terminated with a written examination in which most of the students have taken part successfully.

The courses have been thoroughly evaluted by students and teachers and modified on the basis of these evaluations.

It is not easy to arrange a course on I & D for students with widely varying backgrounds and needs, with the help of teachers usually not experienced in teaching, and with no accepted standard syllabus or textbooks to rely on. The great interest shown by the students and teachers has helped very much however, as well as the fact that most of the students and teachers have their own experience in I & D-work. A considerable part of the time has been spent in discussions, and students without experience have learned much from the others.

The principal ideas of the course might be expressed as follows:

— The students should learn to disseminate information *actively* in their work, not just sit back waiting to be asked.

— They should learn always to think of the *users* and adapt the information to their particular needs.

— They should learn effective means of controlling the user's response to their information by getting *feed-back* in various forms.

The activity of the information specialist is in fact the basis of his whole work. He has to sell to management the idea that information is something that pays. In an industrial company looking hard at cost-effectiveness aspects he will otherwise be pushed aside. And the best way of « selling » information is to give management quick and effective service, not only in technical questions but about market and other things that interest management as well.

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ASPECTS OF INTEGRATION AND SEPARATION IN TRAINING FOR INFORMATION AND DOCUMENTATION

by
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There are numerous professional rôles in information work which are at different stages of development and definition. There is the field of computer science which aims to be completey integrated with information and documentation. The problem of integratoin and separation in training occurs in these general areas. The meaning of information which seems to be appropriate for information work is « reduction of uncertainty ». Taking this as a criterion for decisions about separation and integration, it will be found that information sciences and computer science could be quite separate with regards to training while the different occupational rôles in the field of information and documentation shold be reflected by an integrated system of education.

I. *General remarks*

It is nearly impossible to deal with a theme in the field of training and education on a rather general level that neglects the specific pre-suppositions of one country. Considerations about problems of training and education mostly depend on the whole educational system of a country, on the structure of occupational rôles, on the specific historical situation. This is particularly true for considerations concerning the relations of specific occupational rôles to each other, the ways in which existing educational structures can be transformed into future ones, and the ways to incorporate existing and developing sciences into schedules for occupational training. Therefore the following considerations, too, depend on the specific situation in a country, the German Federal Republic, although a more general approach has been attempted. The specific background of this paper is, that at present the government of the German Federal Republic is trying to develop a broad programme for promotion of the whole field of information and documentation and within this programme the aspects of training and education, of course, will require considerable attention.

II. *The general problem of integration and separation*

If we at present try to find out how to design educational aims and structures in the middle and long term — and we have to — there are at least two main problems:

A. The field of information work is not a new one, but it is a rapidly changing one. That means that there are:

- — occupational rôles which are very well established, through centuries, like archivists and librarians,
- — occupational rôles which have developed during the last ten to twenty years and are now in fact established, but are neither very well defined nor in part accepted by governments, and have not been fixed into widely accepted schedules. In this area we find terms for occupational rôles such as documentalist, information specialist, information officer, information analyst, technical information analyst etc. and it is not possible to find well accepted definitions in each case.
- — we have occupational rôles, which are non-existent at this time, which are at the moment only tasks which have not been fixed into occupational rôles requiring specific training. Those rôles may be the planner and designer of information and documentation systems, the manager of information and documentation systems, the user analyst, the supervisor of data banks, and so on.

Within each information and documentation system, tasks which belong to these different kinds of occupational rôles have to be done. Therefore we have to plan education and training for those rôles. But we have to face the problem of how. In some cases attempts are made to incorporate training the newly developed co-occupational rôles within existing schedules, e.g. to incorporate documentary training in schedules of librarian education. In other cases the building up of separate schedules beneath the existing ones has been attempted. This is the first time that we face the problem of separation or integration.

B. The second time we are confronted with this problem is connected with scientific and tehnological development. The field of information work is an old one. But due to rapid technological development, particularly the development of computers, the kind of work and the means used during work have changed very much and will change even more. People working in the field of information and documentation need a lot of knowledge of these new technologies.

On the other hand, the computer people are forced to establish their own ways of education and training, because they need people who design new computers, new hardware, new software, they need people who are able to deal with existing hard and software and to adapt to new developments. And they cannot ignore the fact that during training in computer science the future computer scientist has to deal with the field of application of this technological instrument. Due to the fact that computer science is a very fascinating field — for the public and official representatives mostly much more fascinating than information work — the problem of integration and separation occurs on another level. Should training for information work and training for computer science be integrated or separated? There are claims and attempts to incorporate most of the fields of training for information work — especially at the scientific level — in the schedules of computer science. On the other hand, there are attempts to establish besides the courses for computer science separate courses for information science. This problem is a very serious one because no country has enough resources, financial and personnel, to waste them in some kind of struggle between hostile brothers.

III. « *Information* » *as a criterion for separation or integration*

Looking at the discussions about these two main problems of future development in different countries it seems that one of the most confusing aspects in this discussion is that the term « information » (or other terms based on the same root) is used in very different ways. This often leads to very different positions, names, and organizational structures. If it would be possible to point out what is meant by this term in compounds like « information work » it would be easier to decide about what should be integrated and what should be separated. An extensive analysis of the usage of the term « information » showed about six main variants of meaning [1]:

A. « information » as the *structure* of the world, e.g. « We could define information as the position of all the atoms and molecules in the universe and of all the sets and combinations of those atoms and molecules at any time » [2].

B. « information » as some kind of *knowledge*, i.e. not the material world itself, but its reflection by the human mind: « Information is knowledge concerned principally with qualitative concepts or ideas » [3].

C. « information » as the *message* that is used to communicate this knowledge, e.g. Perry defines information as « ... a combination of meaningful signs... » [4].

D. « information » as the *meaning* of this message, e.g. the definition of ISO/TC 97 « The meaning assigned to data by known conventions ».

E. « information » as some kind of *effect* of messages, e.g. « In fact we may say that information is that which changes what we know, i.e. it modifies our internal model »[5].

F. « information » as a kind of *process* or *action* of transferring messages.

This listing of different approaches may be looked at from two main aspects:

- the terminological aspect. This shows that for all the variants except the variant E (information as the effect of the message) sufficient terms exist to denote exactly the intended meanings (A.: structure; B.: knowledge; C.: data, message; D.: meaning; F.: information process, information work).
- the viewpoint of applicability. This shows that the approach of structure is a philosophical one, that the approach of knowledge is one that is applicable in decision theory, that the approach of message is that of mathematical information theory, that the approach of meaning is a linguistic one. Only the last two approaches, that of effect and that of the process of responsible action, refer to the field of information and documentation.

That means that in our field of information and documentation we have to start from and centre around those two approaches. This, of course, is obvious, but often overlooked. We do not want to recognize all the existing structures of the world; we do not only want to transfer knowledge, data or meaning, but we want to take care that people will be informed, that they get the knowledge, data or meaning that they need, and that it effects something. The effect intended by information work may then be called « reduction of uncertainty ».

In a cybernetically derived model[1] uncertainty can be explained to exist, if in any problematical situation (real or imaginable) an organism does not have a programme available for the solution of this situation, and has to change its internal model of the environment, particularly by receiving data from the outside. Information work then has to try to define those classes of problematical situations (e.g. in terms of subject field, of user needs, of user types etc.) and to transfer those data to the persons who have the highest degree of probability of reducing the uncertainty in order to allow the people to solve the problematical situations.

This is a rather short version of a detailed discourse about the problems of the basic approach of the whole field of information and documentation, and particularly the practical realization information work has to take. But even in its brevity it allows the following to be used as criteria in decisions about integration or separation:

- — those fields which do not centre around this basic aim may be separated to the extent that they differ from the basic aim;
- — those fields which do centre around this basic aim should be integrated to the extent that they are or will be concerned with this aim.

IV. *The relation between information sciences and computer science*

The results of the discussion in the preceding section lead to some conclusions concerning the second major problem, which may be described as the problem of the relation between information sciences and computer science. This problem is essential both for the further organization of research and training.

Documentary work has been done since the beginning of this century — as a branch of practical work. But as the tasks grew, technology became more complicated and the information needs of the users widened and changed. The need for a scientific discipline covering this field became obvious. Since about 1961 in the USA the term « information science » has been used to denote this growing branch of knowledge and research[6]; since about 1966 the term « informatics » has come into use in the socialist countries[7]. Within this discipline or branch traditional library science still existed and some years later started to discover the aspect of information, too[8]. The example of library science indicates that there are a lot of existing and growing sciences and branches of research which are centred around the term « information ». This term is a central one, for example in sciences like computer science, cybernetics, genetics. But these sciences are using another approach to « information », namely the approach called information as a message, which is very different from that which is the appropriate one in the field of information and documentation.

But there are some sciences and branches of research which are centred around the effect approach to information, which are interested in the specific effects of messages reducing uncertainty. Contrary to the above-mentioned disciplines, which are mainly formal and technological disciplines, they may be characterized as more socially or behaviourally-oriented, because they are interested in the effects on human individuals arising from concrete social conditions. To name some of these disciplines:

- — a discipline we call « information and documentation science »[9], as it was first done in the German Democratic Republic[10]. This discipline is concerned with the study of scientific and technical information systems. It is nearly identical with the « informatics » of the socialist countries and some narrow interpretations of « information science » in the Anglo-American countries.

— library science as the discipline concerned with information systems including libraries.

— archival science as the discipline concerned with information systems including archives.

— mass communication research as the discipline concerned with communication systems trying to inform a mass public.

— psychology of information which is concerned with the psychological factors influencing information processes.

— sociology of information which is concerned with the social factors influencing information processes and systems.

— information technology which is concerned with the problems of the application of technological media in the field of information work.

Some other disciplines may be added, but this is not essential to our problem. All these disciplines are characterized by the fact that they are dealing with information from the aspect of effect, either by studying a certain kind of information system or by studying certain elements of information systems. Since in the solutions of concrete information problem results of all these disciplines are needed and have to be integrated it seems to be appropriate to comprise them under a generic term and to call them « information sciences »[11].

The information sciences as a whole are concerned with the study and development of the scientific basis of all kinds of information work, including the information work in science and technology. Therefore all of them have to participate in all kinds and on all levels of education and training for information work in the field of information and documentation. To come back to our guiding topics — integration and separation — these demand the integration of these disciplines in education and training for information work.

On the other hand, the amount of knowledge and the number of skills to be transmitted to the students require separation — separation from other courses of studies. This is particularly true for computer science. To become a good computer scientist so much time is needed that it will be impossible to be a good information scientist at the same time and vice versa. But this should not lead to the conclusion that there are no points of contact. Of course, some courses of specialization in computer science, particularly those concerned with computer applications in the field of information and documentation, need a sound introduction into the information sciences, and vice versa. But these intersections between information sciences and computer science are in principle of no greater importance than intersections of both sciences with, for example, linguistics or medicine.

This demand for some kind of separation and co-operation in overlapping areas, for example through practice in the development of information systems[12] in a specific subject field where at least three different kinds of people with different vocational training are needed:

- the subject specialist, (because only he knows exactly about the problems of the subject field, knows the terminology and gives the background for the subject interpretation of user interests, etc.).
- the information scientist, (because he has the skill to analyze user interests and needs, to design the optimal information flow, to choose or develop appropriate documentary languages like thesauri etc.).
- the computer scientist, who alone is able to choose the optimal computer configuration, to take care of the appropriate software implementation of the problems analyzed by the subject specialist and the information scientist, etc.

As it is not possible to integrate all the three elements within one course of study, it is advisable to separate them during training and education and integrate them in practical work by means of teamwork.

V. *The relation of the different occupational rôles to each other.*

Whereas the area of relations between information sciences and computer science was characterized by a need for partial separation, the reverse is true for the other area we have to consider: the relations of the different occupational rôles in the field of information and documentation to each other. Both decisions are based on the same structure: starting from the finding that in the field of information and documentation a behaviour-oriented approach to information is necessary, we came to the conclusion that a lot of disciplines have to be integrated in order to solve the problems appropriately. This leads, on the other hand, to the conclusion that the integration of these disciplines will provide a general basis which is usable, if not obligatory, for all kinds of specialization within this field.

Traditionally in most countries the vocational training for the different occupational rôles is separated. Even in those cases, where no different courses of study for archivists, librarians, documentalists and information specialists are formally distinguished, in fact there are different ways of training. A unitary occupational training will be able to prepare either only a part of the students adequately for one profession, or to prepare all students only partly for all professions. If, for example, the training is mainly oriented towards librarianship, the students who take over tasks in documentation or information later on have to learn on the job what they did not learn during their studies. But this is worse than having completely separated courses, because it costs money and time to be trained on the job and perhaps leads to mistakes in the work that may cost even more money and time.

On the other hand, completely separated courses for the different occupational rôles have nearly as many disadvantages as a unitary training which does not cover the different tasks which will need to be fulfilled in later professional work. The students will be prepared for a specific task; they cannot change from one field to another; they will have problems in adapting to technological and methodological changes.

We have to see that the different institutions: archives, libraries, documentation centres, information centres, information analysis and evaluation centres, data banks — and occupational rôles: archivists, librarians, documentalists, information specialists, information analysts, information scientists only play different rôles in the same game: the game of scientific and technological information. The tasks they are taking over are not contradictory — as it seemed for a long time from the discussions between librarians and documentalists — but are complementary. Every time someone provides the user with unpublished documents, books, references, abstracts, or data, he adds one little stone to the mosaic of information work. And because of the unitary aim, there has to be a good deal of integration in vocational training. In each case the information worker has to deal with users. Therefore, all have to have a common knowledge of them. They all deal with knowledge, recorded in some form. Therefore, they need common knowledge about the principles of how it can be recorded, communicated, transformed, evaluated etc. They are all working under similar legal and political conditions. Therefore, they need common knowledge about them.

This leads to the conclusion that all information workers need a lot of common knowledge, no matter where they are working.

This will enable them to understand the other occupational rôles much better, to change more easily from one occupational rôle to another and to adapt more easily to the future developments we are aware of.

On the other hand, they need some kind of special knowledge, according to their chosen professional rôle — an archivist must know much more about administration than an information analyst, and so on. This leads to a future picture of vocational training which will be characterized by two complementary trends: integration and specialization.

A model developed for the specific situation in the German Federal Republic may illustrate this. (This is not an official model yet, but it is backed by a group of information scientists).

Due to our historical situation we are faced with an educational structure which distinguishes three fields and three levels of vocational training. The three fields may be characterized by archivistics, librarianship, and information and documentation; the three levels are middle, higher and scientific level. In addition, we have to face the situation that the three traditional fields and levels are oriented towards practical work, whereas no occupational rôles for more theoretical work are defined.

According to our educational system and the plans of government for future structures a model was developed which distinguishes between a shorter vocational training (about three years) for practical work and a longer education on a more scientific level for information scientists (about four years). The training for more practical work is then divided into three stages:

- a stage where all students will have the same schedule, in which the basic knowledge about information systems etc. will be transferred;
- a first stage of specialization in which the students begin to specialize in the fields of either archivistics, librarianship, or information and documentation. At this stage it should be possible to change fields easily; e.g. change from librarianship to documentation;
- a second stage of specialization where the students are choosing specializations within their field, e.g. in information and documentation, the field of data banks, reference retrieval, or something else.

At each stage it should be possible to change from the practical training to the more scientific training of information scientists. To make this easier the students should partly have the same lectures in practical and theoretical training.

The persons needed for the subject oriented-tasks like information analysis in this model will come from two sources:

- either they have graduated in a specific subject field and will be trained in additional courses (about one to two years) in the specialities of information work;
- or they have finished the practical training or some numbers of courses in information sciences and then undertake a special follow-up study in a subject field.

Students having finished the practical training can then get the qualification of an information scientist by special short courses.

Students of other disciplines, particularly computer science, can take courses in information sciences as they need them in their course of specialization.

This model is, of course, a very general one and designed under special conditions. It will not be widely applicable, and even in our country will not be realized for a long time — if realization will ever be possible. But it shows some principles which seem to fit all the industrialized countries in the near future:

- a unitary basis of knowledge and training for all information workers;
- several stages of continuing specialization during vocational training to enable as much permeability between the courses for the different levels and fields during training as possible;
- some kind of distinction between training for more practical work and more theoretical work (like analysis, design, and control of information systems), but as much permeability as possible between both courses of study;
- as many entries as possible from other disciplines into the field of information and documentation.

In addition it has to be noted that this system has to be appended by continuation courses and studies, enabling change of occupational rôles and adaptation to new developments.

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SESSION II

Training of Information Users

INVITED PAPERS

SCIENCE AND INFORMATION: SOME IMPLICATIONS FOR THE EDUCATION OF SCIENTISTS *

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The paper discusses several contemporary issues which bear on the question of information use by the scientific community. Three specific aspects of science are explored as to their implications on information use: the social structure of science, its management, and its effectiveness. The basic conclusion of the paper is an argument for a broader, more encompassing approach to education in science information use.

Introduction

Interpreted uncommonly broadly, « education of information users » is tantamount to education in the acquisition of knowledge, as carried out through the social establishment of formal education and schooling. Among the purposes of education are to inculcate the habits and techniques of asking questions (identifying information needs), locating sources of information, and acquiring « knowledge ». The process of learning is sometimes viewed as an « information process », and the enterprise of education as an « information system »; our understanding of the information processes which underlie and implement learning, of course, leaves much to desire.

At some time in the future, when information science will have developed the concepts, methods and tools of a regulatory discipline with respect to the management and use of information as a resource, education as a whole may come to be viewed literally as training of information users.

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Conscious and explicit attention will then be paid by education to the cultivation of information conscious humans, continuously attuned to the evaluation of information and data, and to the management of information as a personal, organizational, national and social resource. Such a viewpoint of education is perhaps most likely to be first introduced in science education, where the notion of information as a utilitarian resource is already beginning to be accepted.

Meanwhile, however, « education of information users » continues to have a narrower connotation, such as the training of various categories of people in the utilization of stored, predominantly bibliographic records. Much of this training effort has traditionally been directed at the community of science although, as we shall indicate later, the training need in other professions is equally urgent.

Other papers in this Conference address themselves to specific issues of the broad subject of training of information users. Our objective is to highlight several global contemporary issues which bear on the problem of information use in the scientific community. We will attempt to show that the nature of the scientific enterprise, of which vague understanding is gradually being perceived, has important inferences and implications bearing upon the issues of information need, information use, and training in information work. Specifically, we are interested in the information-related implication of: *a.* the infrastructure of science, *b.* its contemporary management, and *c.* its effectiveness. Our basic conclusion is an argument for a broader, more encompassing approach to education in information use.

The Social Structure of Science

Among the undecided key questions concerning training of information users in science is the dilemma whether such training should support and reinforce the information using habits and practices of the scientific community, or whether it should attempt to alter and modify at least some of them so as to be, in some sense, more effective and/or efficient. The main reason for the persistence of this dilemma is our inadequate understanding of the phenomena of information « need », « requirement », « use », « transfer », and « communication ».

Research in these phenomena has a long history, and its more recent results are usefully summarized in the volumes of the *Annual Review of Information Science and Technology*[1] and elsewhere. We therefore do not intend to discuss here the detailed findings of this research, except for highlighting some of its implications on education and training of information users in science.

As is well known, the majority of studies in information need and use have been descriptive surveys, by diary, questionnaire and/or interview, of habits and practices of various groups in the science community; the objective of these studies has been an attempt to derive statistically meaningful descriptions of the information-related behaviour of members of this community. The findings of these studies have surprised and disappointed those who were looking for support of the argument that man's creative activity depends heavily on his frequent, continuous interaction with recorded information. They provide, *au contraire*, evidence favouring the hypothesis of W. L. Saunders that information in the librarian's sense makes a smaller contribution to the creative process than librarians and others like to believe [2]. If true, this conclusion should not go unnoticed by those concerned with science training and education.

Another, more recent approach to illuminate the information processes in science has been pursued by a handful of investigators. Their effort, concerned with a description of the structure of science as a social enterprise, is of interest because it attempts to derive this structure of the basis of the communication patterns of the science community. Since these communication patterns are concerned not only with recorded information (e.g., documents) but also information resident in human memory, this research effort offers a promise of a more realistic description of the behaviour of scientists as information users, not restricted *a priori* by the bias toward recorded information.

Before discussing some of their implications on the subject of this Conference, we wish to review briefly the relevant, possibly intermediary and tentative, conclusions resulting from this direction of investigation.

The community of science comprises an ordered structure, some of whose characteristics are described by the simple random distribution which governs many other behavioural phenomena of society [3]. One such characteristic is the scholarship, or value of scientific contribution, measured in terms of its impact on science and scientists. Thus fifty per cent of the scholarship, or value, contributed by a ranked list of n scientists is due to the top $\sqrt{n}$ (e.g., approximately to twenty-two out of a ranked list of five hundred scientists). This distribution describes a peculiarly uneven structural hierarchy of scientific disciplines, at the apex of which are very small groups of highly influential scientists whose impact far surpasses their size. The notion of these « scientific elites » was postulated ten years ago by D. J. de S. Price [4].

Although the existence of elite groups of science researchers was later questioned by others, notably by Mullins [5], very recent investigations tend to confirm Price's proposition. B. C. Griffith *et al*, while not defining the elites explicitly, conclude that « within an active research area there is... an intensification of scientific communication focused upon a small elite, whose activities as individuals attract other researchers and students... » [6]. The picture that emerges confirms an intuitive appraisal of informal communication in science: those scientists in a subject specialty who produce and publish significantly have more frequent contacts among themselves, and they are the object of contacts by the non-publishing scientists. The mass of non-publishing scientists, on the other hand, exhibit among themselves only rare and random contacts whose number is constant.

In the context of our objectives, these and related sociometric studies in the social structure of science are important because *a.* they link communication and productivity, and *b.* they relate communication to recorded information. With respect to the latter point we observe that although the elite and the non-elite groups apparently have different communication patterns and customs, the initial impetus for information communication between the mass and the elite of science is given by the recorded contributions authored by the elite.

This hardly surprising, and therefore seemingly trivial, conclusion is nevertheless a strong argument justifying a training of scientists as information users. Such training should recognize the apparent differences in the communication practices (and, very likely, in the information requirements) between the elites and the mass of the science community. Members of the elite « invisible colleges » in science have generally shown a disdain for information services and systems; as Griffith *et al* point out, « high scientific productivity is such a rare commodity that active researchers in any general area are usually acquainted with each other ». On the other hand, a key desideratum for the non-elite majority of the scientific community appears to be an ability to *a.* monitor the activity and production of the elite groups of science whose work accounts for much of the value of scientific knowledge; *b.* rapidly disseminate this knowledge; and *c.* promptly exploit it. Even though improvements in the rapid delivery and utilization of new knowledge are still desirable, we have been for years quite conscious of the importance of the latter two capabilities; the crucial ability therefore is the first one. In this respect, Price contends that although retrospectively it is easy to identify contributions and scientists who have been successful and of most value, it is difficult « if not impossible to know in advance that any particular people or papers or books or concepts will become part of the core or the elite »[7]. We have, however, recently described a technique which permits the monitoring of the trends of science[8], and it would seem that one might at least expect the probability that such major contributions will occur more frequently in the directions and areas of science which are being emphasized rather than those phasing out.

On the surface it would appear that we need not be much concerned with the training of the science elites in information use; their members have a high degree of contact with each other, and an automatic input from those in the remainder of the science community who are interested in their work. Yet it is most important for us to continue paying close attention to the behaviour of the science elites, and especially to clarify two questions: *a.* the relationship between the productivity and communication customs of these groups of scientists, particularly the possible existence of a causal relationship between the two characteristics; and *b.* the reasons for the high degree of interaction among them, the basis and nature of it, and particularly the contents of the information transfer among the members of such groups. Clearly, if we are able to show that personal communication is causally related to productivity, and/or that some crucial elements of that which is so communicated are not being transmitted through the traditional or modern information services and systems which are based on recorded information, we may have to reconsider some of our notions about these services and systems, and along with it our approaches to the education of information users in science and engineering.

Organization and Management of Science

The social structure of science described above has existed as an invisible, behavioural law of the organism of science throughout the centuries of its development, despite the gradual changes in political organization and management of science. The organization and management of science — that is, its institutions, their objectives and activities — are the visible part of the scientific enterprise which, contrary to the infrastructure of science, exhibits continuing and sometimes drastic changes of direction. In this section we wish to consider selected effects of the political development of science on information-related issues of the scientific community.

The continuing metamorphosis of the goals and organizations of science is eloquently described in the synopsis of the UNESCO feasibility study of a World Science Information System:

> « Science is undergoing a revolution in our time, in the course of which its goals and its institutional forms are being reshaped... The scientific revolution... is in itself a highly complex phenomenon. In contrast to the compartmentalization of science in the 19th and early 20th centuries into academically defined disciplines, large scale public funding of science for social goals, energy sources, food supply, health, and national defense, has resulted in what has become known as "mission-oriented" research. Perhaps "problem solving" research would be a more appropriate term, since it is the methods employed rather than the governmental sponsors of the research that have reshaped the information problem.
> Problem solving research in the sciences may draw on any discipline that can make a contribution to the solution of the research problem which has been identified as an objective in a long range

> programme. It involves both basic and applied scientific research. It creates new groups, multidisciplinary in origin, which develop homogenity in time, but which may initially be highly heterogeneous »[9].

Observing that traditional as well as newer information services are « all under challenge to modify their functions and services to accomodate science in its new forms ', the UNISIST study lucidly describes the information-related behaviour of problem solving science:

> « These new groups look at the existing information services which have served the academic purposes of science so long and so well, decide that their problem solving biases require something different, and that they must develop their own. It may be observed that the first requirement of a new interdisciplinary group in science is usually for retrospective bibliography recording the contributions of their several disciplines to the field as defined; the second requirement is for one or more journals to communicate findings; the third requirement is for an abstracting service to keep abreast of new developments in a new field and in related fields. Problem solving, interdisciplinary science has created an insatiable demand for the "packaging" of scientific information in new forms »[10].

There are two important points in these statements which deserve our attention, insofar as they challenge our traditional approaches to problems of information access and use in science. They are *a.* the preeminence of method in problem solving science, and *b.* the re-packaging of scientific information. We shall in turn briefly consider these two points.

In academically-oriented science, methods and techniques are often viewed as proprietary to a discipline or field; and it is taken for granted, both by scientists and science educators, that they are taught as part of the formal education of the field or discipline in question. Our information services have made a similar assumption, and accord problem solving methods a specific mention only when new and/or innovatively employed. The emphasis of information services has been mainly on substance and result rather than method — who does what and with what results, rather than how. Rare attempts to process, store and retrieve documents from the viewpoint of the scientific method indicate strongly that the existing literature, in full text or surrogates, is woefully inadequate and unsuitable for this purpose[11]. Whereas over many years we have built up numerous classification systems of concepts and subjects, there exist no parallel classifications of the methods and techniques of science, either artificial or empirically based.

In problem solving science, however, in which the major goals or objectives of research are usually given *a priori*, the crucial initial effort is the identification or development of methods whose application accomplishes or contributes to the problem solution. Unlike in traditional, discipline-bound science, suitable methods are not immediately apparent or available, and hence the search for them turns « interdisciplinary ». The absence in both science and its information services of efficient mechanisms to identify, locate and retrieve relevant methods and techniques from the massive reservoir of the scientific method is a distinct obstacle to problem solving science.

If, as we suggest, the effectiveness of problem solving science is related to the premise that any method, technique or tool is proprietary to science as a whole, our information and communication services would be well advised to incorporate in them devices for the description, recording, accessing and even evaluation of the methods of science. Unless these devices are developed, the « criticality of the needs to construct more flexible and responsive information systems on the basis of the older conventional systems »[12] (which the UNESCO study sees to characterize the science information problem in the developed countries) will be aggravated. The function of educators, on the other hand, is to alert the science community to the necessity to view the scientific methods as supra-disciplinary, and to train it in the use of such access devices as we may develop. Perhaps, in addition to the popular dictum that « information is the most important ingredient in decision making » we should impress upon ourselves and others that « method is the most important ingredient in problem solving ».

The second desire and requirement of problem solving science is for a continuous scan of results of current research which bears directly or implicitly upon its goals and activities. Much of our attention to the resulting « insatiable demand for the packaging of scientific information in new forms » has concerned itself with the boundary problems of a knowledge system in which every item potentially relates to all other items. This attention has perhaps been at the expense of the consideration of the serious time delays incurred in the re-packaging process. We are aware that the time consuming and expensive medium of « annual reviews » is hardly a current-awareness device describing the current « state-of-the-art », and that its primary usefulness is to education rather than to problem solving science.

An illustration of one attempt to derive, from a single base of the documentary record of science, current information tailored to the interests of problem solving science may be in order. At the Georgia Institute of Technology School of Information and Computer Science, we are studying the design and use of an interactive, computer-aided system for on-line compilation and composition of narrow-scope state-of-the-art summaries. The contention being evaluated is that a qualified scientist can produce, in a man-machine interaction with a suitable, indexed data base, a stylistically acceptable descriptive summary of current work, ready for duplication or printing, in a period of few hours rather than months. The anticipated economics of the product may warrant the frequent preparation and distribution of highly current, very specific, and transitional awareness type information products directed at small groups in problem solving science. The general scheme of such an interactive, machine-aided system is shown in Figure 1.

The information-related issues in interdisciplinary, mission-oriented science challenge those of us who are concerned with the design of information systems and services, as well as those concerned with the education of scientists for working with information. Jointly, we should seek to comprehend the changing nature of information requirements by the science community, and to examine the limits to which our information services and communication practices satisfy such requirements. With such objectivity, our education can go beyond the mere selling — sometimes uncritical — of our products and services; it is within our responsibility to explicate the information and communication processes in science also in areas in which we currently have no products to sell or services to offer.

Effectiveness of Science

In the previous two sections we discussed briefly two aspects of science, its social infrastructure and its political organization and management, and their relation to problems of information use in the scientific community. In the present section we hope to show that the function of science, and that of other professions, will increasingly become more information centred. Our argument is based not so much on the inevitability of « thinking » automata as it is on the probability that machine augmentation of the problem solving resources of man is necessary to improve the cost effectiveness of human professions, including science.

It is common knowledge that the development of information processing machines, particularly of the digital computer, signals a departure point in man's quest for automation. In contrast to devices which automatically perform sensing and motor tasks, thus replacing or improving human capabilities for performing physical functions, digital computers are devices capable of rapidly performing complex logical and decision-making tasks. Computers thus hold the promise of replacing or improving certain intelligent functions of the human mind. These higher level problem solving functions are normally those identified with the practice of the « learned professions » such as medicine, education, law, government, management, as well as science and engineering.

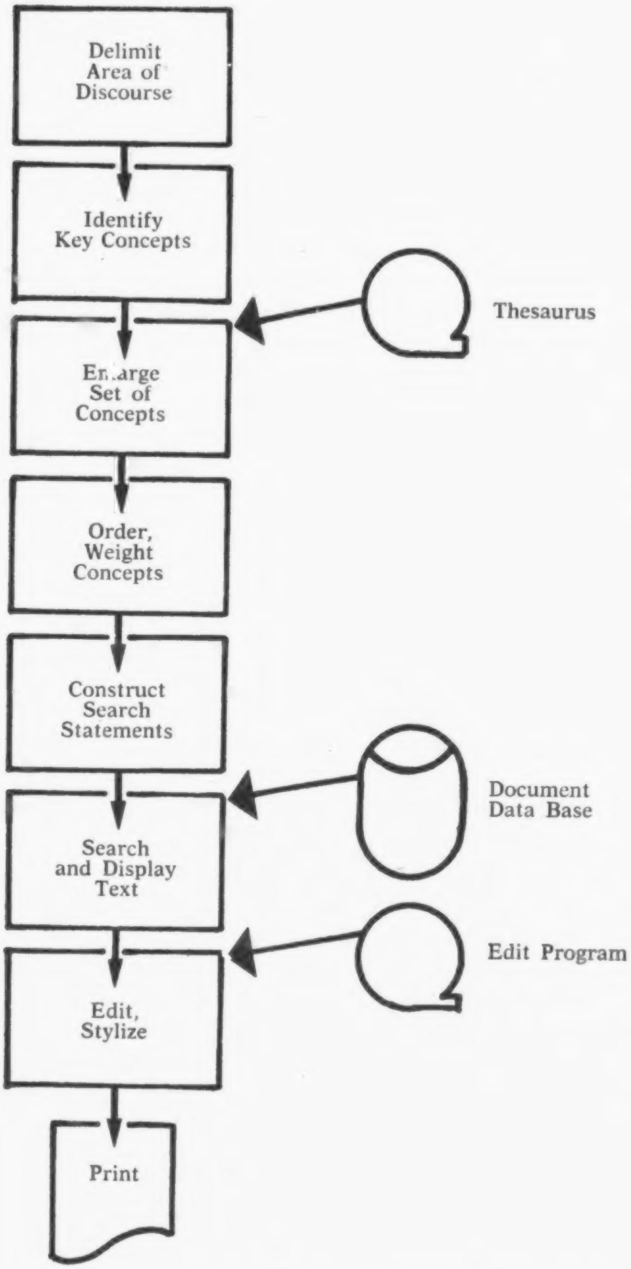
Delimit Area of Discourse
Identify Key Concepts
Thesaurus
Enlarge Set of Concepts
Order, Weight Concepts
Construct Search Statements
Document Data Base
Search and Display Text
Edit Program
Edit, Stylize
Print

Fig. 1. - Machine-Assisted, Interactive Preparation of State-of-the-Art Summaries

It is useful to diverge briefly and consider why this advanced application is logical as the next step in the transition to a post-industrial society. From the technical standpoint, this direction begins to take a fuller advantage of the nature and the power of the digital computer as a « knowledge machine » which stores information in vast, internal « memories » and operates on it at extremely rapid speeds by invoking internally stored instructions called « programs ». Viewed in this manner, the functional capability (although not necessarily the method of operation) of the computer is remarkably similar to that of the human problem solver: he, too, stores information (the substantive facts of his discipline) in his memory, and operates on it by employing appropriate procedures (equivalent to « programs ») which comprise the methods and expertise of his profession. It follows that to the extent that the substantive information and the decision procedures (that is, the « knowledge ») of human professions can be described, tested and formalized or structured, it is possible to construct large, computer-based « knowledge utilities » encompassing significant portions of the knowledge of the human problem solving professions. Used by man, these knowledge utilities will become his inanimate consultants whose capacity for storing knowledge, reliability and efficiency promises to magnify the effectiveness of human problem solving.

At least as important as the question of technical feasibility, however, is the considerable possibility that the development and use of knowledge utilities as aids in human problem solving may be the only viable approach to the further progress of advanced societies of man. We have become aware that the number and magnitude of needs, problems and opportunities perceived by man far exceed the professional resources presently available for the solution of these needs and problems, and for the attainment of these opportunities. Examples abound: in education, the professional service of educators does not meet the recognized need or desire for learning by the many strata of society; in medicine, health care provided to the peoples of the world is less than adequate; in science, the unknowns are far more numerous than those which can be studied; the magnitude and number of social problems around us greatly exceed the problem solving resources of our local and national governments, and so on. Yet as the needs, problems and opportunities continue exceeding the capacity of the available professional resources, we are equally and painfully aware that society is approaching the limits of its ability to pay for science, technology, education, health care, law, and government. Indeed it appears that there remains only one direction and hope: we must increase the efficiency and the effectiveness of man's problem solving activities to be able to extend the existing resources to accomplish more for man and society.

The only promising approach to meet this challenge is by amplifying the human ability to solve problems. Thus we can expect, during the remainder of this century, the development of large, complex and powerful knowledge utilities to be at the centre of the next phase of automation. We are beginning to experience a subtle but most significant shift in importance from the computer industry to a broad enterprise concerned with information management, the latter embracing not only the computer technology but sizeable segments of all those professions, disciplines and fields which will jointly be concerned with the harnessing of man's knowledge into machine-aided utilities designed to augment the purposeful functions of the human mind.

This « information enterprise » will be accompanied by a parallel thrust in the social sciences. Present-day glimpses into the economic, social, political, educational and legislative implications and issues of the cybernetic age — with which man may have to cope during as short a period as one generation — are overwhelming; they anticipate a profound altering of the activities of professional people; dramatic restructuring of their organizations and occupations, affecting education in all disciplines and at all school levels, and raising deep new issues about the rights, privileges and responsibilities of individuals as well as nations. Although an assessment of the range and depth of the consequences which the information enterprise will bring about is not possible at the present time, the concurrent effort to be expended in studying, monitoring, and adjusting to these consequences will in itself undoubtedly comprise a vast, crucial and indispensable enterprise.

The existence of problem solving knowledge utilities will, we believe, substantially impact education for science, and dramatically emphasize the need of scientists to interact with stored knowledge. We should, therefore, take a moment to consider the concept of knowledge utilities in slight detail.

The knowledge utility fundamentally involves people and knowledge, interacting purposefully in a defined environment by means of technological aids. « Knowledge » in this context includes data and descriptive information, in the usually accepted sense of these terms, as well as « procedures » — the formalized, algorithmic and heuristic processes which members of particular professions or disciplines formulate and agree to use as an evaluted subset of their problem solving or decision making methods, techniques and skills.

Operationally, problem solving knowledge utilities combine three relatively distinct, as yet independent applications of automata. The first of these is the housekeeping, data processing function which is most prevalent today: the collection, organization, storage and retrieval of data and descriptive information; it is typified by science information « data base » services such as we now have in chemistry, physics, medicine, law, aerospace, and numerous other fields. Secondly, knowledge utilities will contain symbolic models of appropriate physical and mental processes characteristic of particular professions or disciplines, including the capability permitting users to construct and operate on experimental models for the purpose of simulating and evaluating ill-defined processes and relationships. Finally, knowledge utilities encompassing real-time experiments or process control requirements (e.g., laboratories, hospitals, education, and the like) contain real-time input, feedback, monitoring and optimization capabilities common to process control systems of today.

Our School of Information and Computer Science is in the process of developing a prototype of a knowledge utility for self-instruction, the primary objective of which is to increase the cost effectiveness of the process of instruction and of the professional enterprise of education. This utility, described elsewhere [13], has all the characteristics of knowledge utilities discussed above, and there is little doubt that it will profoundly affect the activities of teachers — and hence their training. Similar effects are anticipated for other knowledge utilities the development of which are underway, e.g., in medicine[14]. It must then be regarded as irresponsible to ignore the implications of knowledge utilities of the future on the education of their clienteles; the only matter at issue is the timing — when such education becomes indispensable.

Apart from the differences in the technological status quo of the world's nations, it is pragmatic to observe that the most propitious time for the training of the scientific community in information work is the time of its formal science education. It is at this time when enduring habits and practices are acquired, and « educated opinions » formed. It follows that if long-term global changes in the information using and communication characteristics of the scientific community are judiciously anticipated, it will be of advantage to adjust to these changes in the early phases of science education.

Summary and Conclusions

In the preceding discussion we have attempted to discern some aspects of the present and future mechanisms of science as an organized, purposeful, and increasingly more guided activity of society. The picture that emerges affirms the intimate and growing interaction between scientific activity and knowledge. Initial insights into the behaviour of science as a social enterprise cast scientific information and communication in an increasingly important light, and they begin to explain the seemingly controversial habits of scientists with respect to the use and communication of science information. As a result of such insights, more rational information services can be contemplated.

The characteristics of science we discussed have salient implications on information-related education and training of the scientific community. Two such implications, described in this concluding section of the paper, stand out as major considerations in attempts to define the objectives of training in information use in the years to come.

First, it is important that the concept of education and training of the scientific community in information work broadens its notion of science information. The traditional objective of this training — an ability to use bibliographic information sources — should be expanded to permit the interpretation of science information as « knowledge ». In science, knowledge subsumes not only the descriptive (interpreted) information and uninterpreted « data », but also the procedures which comprise the vastly important record of the methods of science. Increasingly, the stored record of science methods takes the form of computer programs the library of which is as much a resource of science as our libraries of printed documents. From the viewpoint of science an ideological distinction between the two repositories of knowledge is illogical and harmful.

Secondly, it is equally important that the concept of education in science information work encompasses, as its integral objective, the training in the full complement of intellectual and physical devices which exist or are about to become available for access to and the use of scientific knowledge. In the past, training of scientists in information work has only sought to make them comfortable in their use of the literature; presently, it strives to also acquaint them with the existence and use of bibliographic data bases and other specialized services. In the immediate future, as the uses of knowledge are increasingly becoming machine-aided and dependent,* education in information work must assume the responsibility for training scientists adequately in their personal use of the complex, symbol manipulating devices which enable them to use continuously the elements of scientific knowledge: data, information and procedures/programs.

At the Georgia Institute of Technology, our objective is to educate members of the scientific community for interaction with knowledge in an increasingly symbiotic environment of men and machines. The programme of educating problem solving professionals for optimum exploitation of knowledge and the tools capable to augment the human mind is a multi-dimensional composite effort of the library, information and computer sciences. The question of which field or who administers such education is immaterial; the ultimate issue is whether or not scientists and engineers are prepared and able to utilize the cumulative record of man's knowledge, through the devices which our professions have provided, to optimize their problem solving functions and skills.

* A Presidential Science Panel in the United States anticipates applications of man/machine symbiosis during the next generation in which the brain is electrically connected to a computer, combining the capabilities of the human mind with the computer's ability to remember and perform routine calculations [15].

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INFORMATION NEEDS OF THE SOCIAL SCIENCES

by
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United Nations,
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The paper discusses 1)distinctive features in the use of information by the two great fields of knowledge (science versus social science and humanities); 2) the « tertiary » information function or a new communication link; 3) the equal partnership between research and information, the discrepancy between demand for information specialists and their shortage owing to the greater attraction of research careers and suggests certain possible remedies for the situation.

Introduction

Society needs all kinds of information, irrespective of *provenance* and *form,* which may be effectively utilized within organized social activities, economic, scientific, technological and so on. What I wish to emphasize here is the *content,* the *applicability* and the *value* of information and not its channels and techniques: the latter are also significant since they make information accessible but their treatment belongs to the « technology of information ».

Scientific information is a subordinate concept of the *intellectual communication system of society.* The special significance of information on special literature within the intellectual communication system of society largely depends on time, subject field and on the purpose of applications.

I. *Distinctive features in the use of information by the two great fields of knowledge* (science versus social science and humanities).

When investigating the practice in the use of information, one can discern distinctive features in the use of research methods and results and in the specialized literature between the two great fields of knowledge, natural sciences and engineering on the one hand, and social sciences and humanities on the other.

The *natural sciences* and engineering have, for the most part, an *experimental* character within which basic, applied and development research can be distinguished. The same may be said in the case of the *direct applicability* of their records which, in the last analysis, become essentially a *force of production.* The information and data are of an *objective* character, the *time factor* (speed) plays an important rôle in the acquisition of scientific information. The applicability of research results and its information thereon *do not belong* to the social system. The results of basic research are not affected by time, but on other levels of research the durability of information rapidly *decreases.* In development research the results can be *directly measured* economically. The processing of *vast amounts* of information and data require the use of *automated methods* and techniques. The « *technical depreciation* » of a large part of information is *extremely rapid.* On account of the time factor, periodic publications, pre-prints and research reports are of decisive importance.

The *social sciences* have for the most part a *verbal* character, but the value of the results in the different branches again varies in practical applicability: historical sciences and humanities, on the one hand, and concrete organizational and administrative branches on the other. The rate of the « *technical depreciation* » *is slower.* Information has to some extent an *ideological* aspect. The applicability of research results and its information *are related* to the social system. In general, the demand for *retrospective* research is greater, and beside the automated methods and techniques, *traditional* information forms, like catalogue cards, bibliographies are very significant. The information value of *books* decreases less rapidly, and among the periodical publications the weekly and daily *press* also represent a considerable reference source.

The recent tendency (in the last two decades) to satisfy users' needs for information is formulated by establishing *computer-aided systems.* It is concerned with the part of the entire body of knowledge which is subject to « technical depreciation » i.e. to *redundancy* and characterized by a vast amount of data. Considering that the bulk of data is in part readily applicable in technical and economic development, and more or less ephemeral in character, the *speed* of processing and *transfer* is the most important factor. Attempts at solving the *automation of information* follow from these factors.

In social science, the rôle of these factors is *less important.* In some fields the volume of data needs *the same treatment* of information as in natural sciences and engineering, i.e. statistics, demography, planning, but the speed-factor could be *disregarded.*

Although *no strict demarcation line* can be drawn between these two large fields of science in their use of information, the distinctive features enumerated above afford a certain basis for differentiation.

II. *The « tertiary » information function or a new communication link*

Concerning the information needs of a part of the social sciences requiring a great volume of data storage and retrieval, e.g. applied economics or management, the problem could be approached by « huge machine memories » as in science and technology. But *social sciences are more literature-oriented;* therefore, the approach of *textual* information needs to open new ways, new solutions *parallel* with the computer-aided programmes.

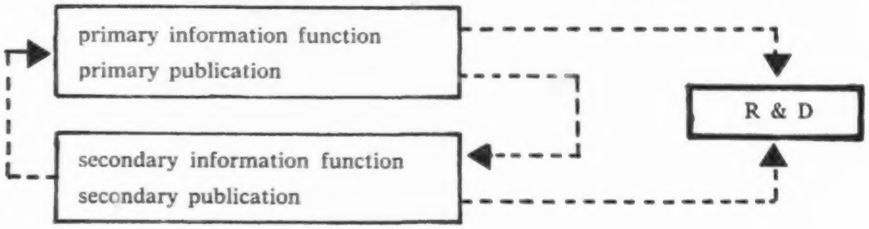
It is essential that the frequently mentioned « information explosion » should be re-formulated. The *exponential increase* of special literature has brought in its wake the *multiplication* of secondary information. An *excess* of information tends in the long run towards *too little or imprecise* information, clouding the needs of the user. In this respect, automation can help only *partially.* There is a *congestion* also in the flow of secondary information.

It appears, therefore, that whether the traditional or the mechanized information processing is used, it is necessary to introduce between the researcher and the information processes *a new communication link* which could be referred to, as is now the practice in specialized literature, as « information officer ».

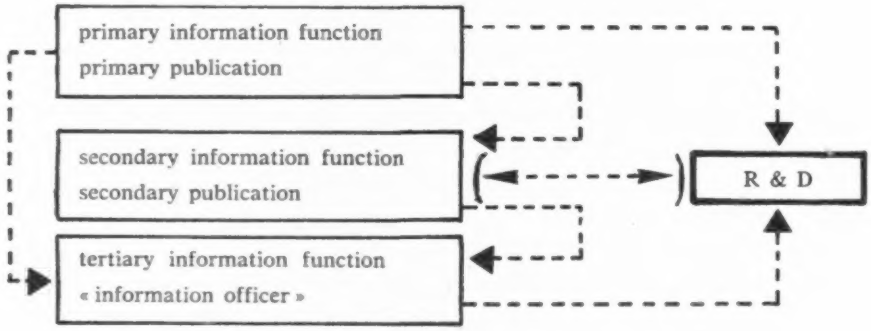
There already exist such research teams in which the exclusive task of one or two members is to provide the team with the required information on the basis of the primary and secondary sources of literature. These members of the team are of the *same status* as the research members.

We might introduce a « tertiary » information function with the rôle of « information officer » who would analyze, on a level with researchers, documentary publication (abstracts, bibliographies, etc.) and notably bring to the attention of *individual* researchers, material *which* is relevant to their research. Another effect of the processing of the secondary information would be to draw attention to new topics and in this way *stimulate* research. The present *maximum* of the processing work of documentation would be the *minimum* of the « information officer's » processing work: apart from producing *subject-syntheses* it would not be concerned with the processing of primary literature (making abstracts, bibliographies, etc.). To put it another way, the work of the

THE SCHEME OF THE FLOW OF INFORMATION


primary information function
primary publication
secondary information function
secondary publication
R & D

THE SCHEME OF THE FLOW OF INFORMATION WITH « INFORMATION OFFICER »


primary information function
primary publication
secondary information function
secondary publication
tertiary information function
« information officer »
R & D

users of {
primary publication:
  R + D + documentation + « information officer »
secondary publication:
  documentation + « information officer »
« information officer »:
  R + D

« information officer » *begins* where that of the documentalist *ends.* What is being considered here is a tertiary information function. This type of activity would be really an *organic part* of the research process, one of its most effective elements. It would demand, apart from a knowledge of the library and documentation, a high level of specialized knowledge of the *research area* in which he operates.

The establishment of the function of the « information officer » as described here, is at the same time a conscious formulation of the *tendency* that the users of documentation, of the secondary information, are in the first place *information specialists and not researchers.* If this is true, then this evalutation could be enlarged. It is not relevant only for social sciences, but in general.

The tertiary information function could not be done by any library or documentation centre, because their regular activities are oriented to the scientific community as a whole (in a branch of science) and not to *individual* researchers.

Implementing a new communication link, the tertiary information function, by means of *research units* (institutes, research teams) based on existing secondary services produced by libraries and documentation centres and partially based on primary literature, is one of the ways to make secondary publications more useful; in other words *to harmonize the contrast* between the tendency of *the scientific information apparatus to expand and the tendency towards a relatively decreasing use of it.*

Between the secondary and the tertiary information function there is no a rivalry but a partnership.

III - *The equal partnership (between research and information) and the discrepancy between the demand for information specialists and their shortage owing to the greater attraction of research careers.*

It could be agreed, that in social sciences the literature search, the consultation of original texts, are *integral* parts of research work. The *critical evaluation* and *interpretation* of special literature and information contained therein requires from the research worker a *more active participation* in the information process, than in science and technology. The last important investigations on the use of primary publications and library services appeared in the *International Social Science Journal*: *2*, 1971 notably the studies of Garvey and Goldberg, which stress the frequent use of special literature and library services by scholars.

Primary literature could be replaced only to some extent by secondary publications. The implementation of the tertiary information function in social science research therefore could be considered as an important factor. The *indication* of relevant literature, data and facts preceded by the critical evaluation of the « information officer » puts the latter on an *equivalent level* with the researcher. In this case, there is an *equal partnership* between the researcher and the « information officer », who in fact *himself* is a researcher with *special tasks.*

But the research work constantly acts as an *absorbing* force attracting the specialists into traditionally recognized research work. Financial advantages, *prestige* and greater possibility of creative work create *a* *dilemma* for highly qualified specialists. A minor article in a scientific journal — and such articles appear by the thousands — qualifies as more than a very important subject-synthesis or a critical evaluation of the stage of research in different topics. The first one is considered « creative » work, the second one as « documentary » activity.

The higher intellectual and material *recognition* of certain information activities, the *re-evaluation* of frontiers between research and information in social sciences, the « equivalency » between research and certain type of information work, the *real integration* of the tertiary information function as *an organic part of research* — all these could stimulate and satisfy information needs in the social sciences much more than establishing new information centres and services.

In conclusion I would like to stress that the above points contain only a few basic ideas in the complex of the information needs in social science. They were formulated without a *definite project* in mind. They are *arguable* but the author thinks that the *formulation itself of certain points of discussion* could be helpful.

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USER PROFILES IN INDUSTRY *

by
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The author emphasizes that scientists and researchers are discipline or topic-oriented, with sustained interests in an area, while industrialists are activity-oriented due to the fluctuating pattern of demands posed to them by their customers. The demands of the industrialists can best be met through personal dialogues with an information officer who can provide stimulating, relevant information. The broad needs of industrialists preclude speaking about profiles. A more realistic structure and diversification in information services are needed in order to transfer knowledge rather than simply to disseminate information.

During the last decades investment in scientific and industrial research has been taken as being the key to progress and the life of mankind. The transfer of scientific accomplishments gained by research into practical results and knowledge has been given a high priority all over the world.

We have not achieved as much as we expected — the information process has not succeeded. What is the reason?

Do we not manage to collect, file, and retrieve the existing knowledge? It the production of new knowledge too exponential in its growth to be dealt with, even by our highly sophisticated documentation systems or by our wonderful and fancy computing machines?

Do we take the right approach, or are we striving too high in our claim for getting easy, quick and perfect access to every piece of knowledge in existence?

We all know that science and research are very costly activities, in investment of money, as well as in investment of highly qualified manpower. Much emphasis has been given to avoiding duplication of research science and research. Many cases have been circulated to illustrate how costly it is to « invent the wheel twice » in science and research. These cases are used as propaganda for investment in perfecting systems for easy access to the world's potential of knowledge.

This is all true - or isn't it?

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* The author points out that this is not intended so much as a scientific paper as a message to provoke discussion.

I am invited here to speak about information in industry. The title given to me is « User profiles in industry ».

I presume the conference organizers expect from me a paper to fit with the pattern made for this conference on how to train industry to benefit from advanced information systems.

I regret to tell you that I do not want to take what traditionally is regarded to be a scientific approach to deal with my topic. I want to take you on a safari in the environment — internal and external — of an industrial enterprise, and invite you to study with me the rôle, the objectives and the life of such an organization.

It might be — by international or national measures — a big or a small enterprise, it does not have to be exclusively an industrial enterprise — it is just an organization, i.e. a kind of civilian task force.

My reason for taking this approach is that according to my experience and understanding there is not an appropriate balance between efforts devoted to development of scientific documentation and information systems and tools, and the efforts devoted to study — how does man in his various tasks and environments react to information and to information systems?

In life men and women are grouped around tasks, which create needs for information — for knowledge. What are the internal and external conditions for such groups — conditions of work, of life, of communication? When do they realize they have a need? What are the motivations of the individuals and of the group to realize and describe their needs?

We have to understand and to accept the structure of conditions existing within the various groups we want to serve. We have to develop methods which will stimulate their demand for information, not pressing upon them, our philosophy, our systems, our techniques.

May I remind you of the words of a great man, Winston Churchill, having the very normal reaction of an average human being: « I do want to learn — but I don't want to be taught ».

I mentioned previously that investment in science and industrial research has been regarded as being the key to progress in our societies.

I would like to call attention to the fact that the basic economy of all countries lies in agricultural production — or as it is explained by economists of today — in the industrialized exploitation of natural resources.

It is stated that further economic growth is only possible by development and growth of industry. An increased effort is exercised in all countries to foster this growth — because profitable industrial production is simply the only way by which governments can procure money enough to develop and improve the standards of living and well-being in their societies.

I say this to underline the social value of a flourishing industry at a time, when industrialized production is widely hated.

What are the characteristics of industrial enterprises?

The history of most enterprises demonstrates that they were created for the purpose of bringing into effect the innovations of the founder, a man having the unreasonable mind of an entrepreneur.

History has proved that as long as an enterprise can keep up with having « the entrepreneurial behaviour » it will make a profit, which is the primary objective of the company.

It makes a profit because it has an expertise to offer to customers and prospective customers, in the form of goods and services having values which meet the customers' demands and buying power.

These are the rôle and the conditions for the survival and growth of an industrial enterprise. There is no proper motivation for being scientific or being highly advanced in technology — unless customers or the competition demand it.

But there are more characteristics of industrial behaviour to be learned and understood.

The life of the enterprise is based upon the corporate capability, i.e. the ability and the will to identify the fluctuation and development of demands of the customers, — and the capability to meet this demand by improvements of technology applied — i.e. searching for the necessary and appropriate knowledge to be exploited.

The life of industry is nothing else but application of knowledge: fig. 1.

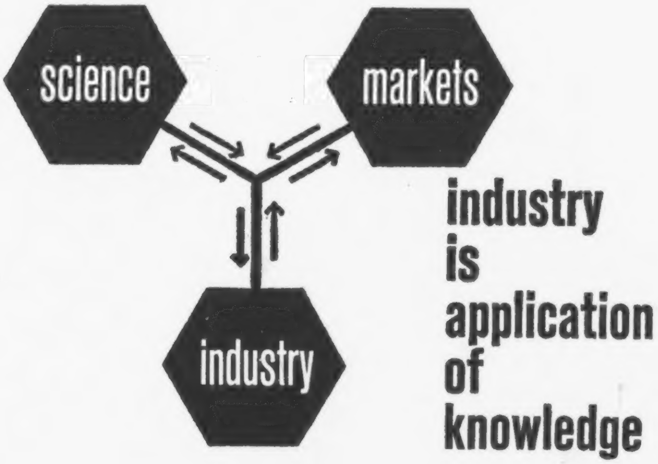

FIG. 1

The enterprise is expected to grow by its owners and society. Growth means growing sales volume: fig. 2. Limitations are: products, applications of products and services, and markets: fig. 3.

Improvement of products, development of new products having new and improved values to the customers, improvement of production methods, application of new materials, new processing methods, improvement of productivity — promotion of new applications for old and new goods and services, promotion of sales in new markets.

These are all challenges which face the enterprise and which call for innovations.

How does the enterprise perform this? By organizing its life-cycle of activities, fig. 4, of which marketing is the primary one.

In spite of what has been said about the importance of science and technological research — they are only the background for industrial

GROWTH OF SALES VOLUME

FIG. 2

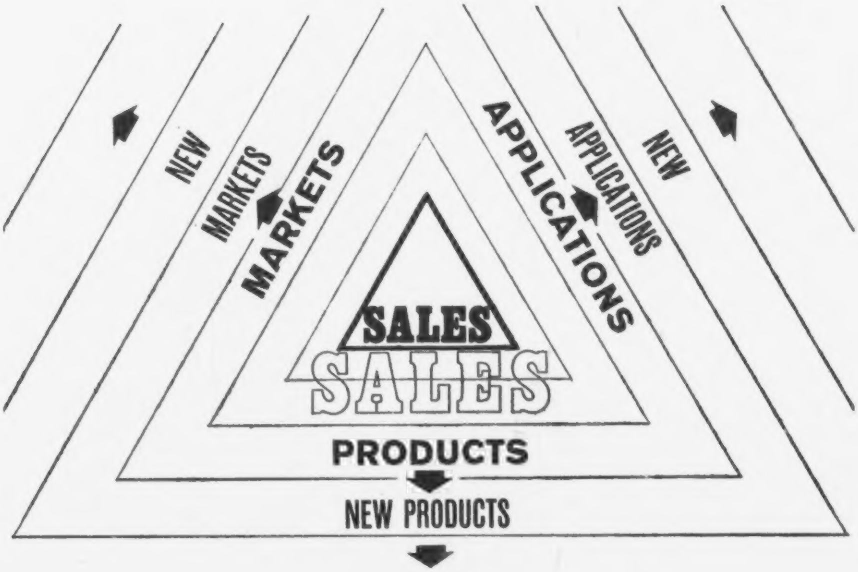

FIG. 3

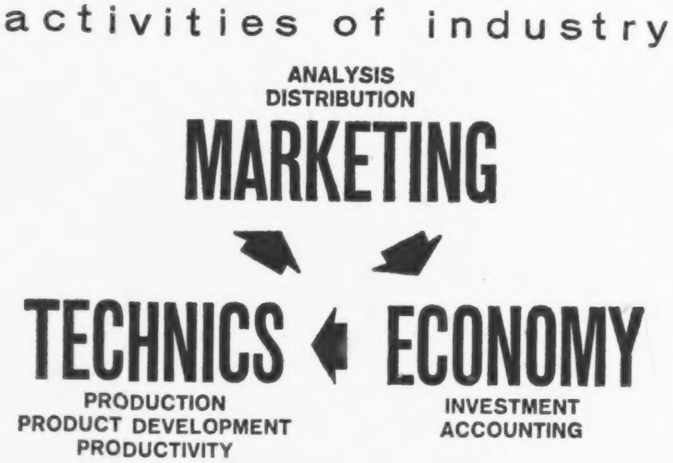

FIG. 4

growth — the background to be exploited, when necessary — the retrospective demand.

We could at this point leave our industrial enterprise for a moment, because marketing as the primary activity of an organization is universal.

It might be a private business, a public enterprise, a non-profit institute, a public service — even an information, documentation and library service. The market analysis and the exploitation of what has been observed about the quality and quantity of demands by the customers for that kind of goods and services in which the organization has or can obtain an expertise is the obligation, is the key to success — it is the primary source to demand for innovations.

Having collected information on the structure of the potential market the enterprise has to create the proper financial background to ensure the improvement and the development of the technical and scientific potential to meet the demand of the customers.

Distribution of goods and services will result in a measurement, by the accounting of the shortcomings and of the successes — The accounts are second in priority as a source indicating the demand for innovations.

This is the life-cycle of an enterprise. But we are missing something. None of these activities can be carried out unless the enterprise is staffed — staffed with competent and capable personnel.

The rôle of management today is primarily to recruit qualified manpower, to cultivate their concept of the enterprise and their entrepreneurial behaviour, to train them, to educate and develop them continuously.

Let us return once again to the characteristics of an industrial enterprise. It makes a lot of difference whether the company policy is to be a manufacturing policy of:

- *mass production* (a limited upgrading of raw materials resulting in high efficiency in processes, methods, standards, and control);
- *serial production* (higher degree of upgrading, very uniform quality and reliability, continuous product development, high quality service etc.);
- *job-order, investment goods, turn-key projects* (high degree of functioning efficiency, advisory service, development and research related to customers' problems etc.).

Further it is necessary to mention the various characteristics according to policies such as:

- to keep pace with developments of others,
- to keep pace and occasionally lead,
- to be in front all the time.

A number of other characteristics of an industrial enterprise could be mentioned, none of them being very specific with regard to science and technology, but all of them being very specific with regard to selection among the enormous amount of information those being relevant for the survival and growth of the company, those to be exploited by the competence of the individual staff member and the ability of the members of the organization to be complementary to one another.

What does all this mean with regard to information and informatics?

A number of studies have pointed out that the innovation activities of an enterprise — as important they are for the survival and success of an organization — are mostly characterised by being irrational, which means that profiles of demand for information are flexible and not very specific.

They are mostly ignited by ideas coming from a diversification of the demands in the market, ideas for which a technical solution is needed. The retrospective search is important.

No innovation will take place no matter how qualified « the signal » is unless the message is « grasped » by a qualified man or woman, having the temperament to relate the signal to the concept and potentials existing in the company.

This means, a company has to organize for a very wide variety in information procured for the personnel, having briefed them very carefully on priorities in the life of the company, so they are able to select the information with which the company is fertilized for the transfer into practical results.

A study by Myers and Marquis of 567 successful innovations, reports, that in fifty-one per cent of all cases the essential information came from the innovator himself, having his education, and experience as a background.

Eighteen per cent came from personal external contacts, eight per cent from experiments, and only seven per cent from documentation — the rest coming from a combination of referred sources.

Other studies are certifying these figures and so are a number of information officers in industry. They indicate that the staff members need a constant provision of information, coming from a selected number of information sources, because the browsing process is so important — the man has to grasp the idea himself — to prevent the phrase « not invented here ».

Bart E. Holm in his contribution to the FID/II Symposium in Rome emphasized the differences of demands existing in an organization in relation to tasks of the individual.

The research man is discipline-oriented and more inclined to rely on literature, than the technical man who is mission-oriented, and the marketing man who is business-and-product-oriented.

The mission of an information service in a company is to analyse the organizational and personality structure, providing a service geared to this structure without bothering the staff members too much with documentation techniques and systems.

Professor Tom Allen of MIT has in his studies shown that even in a research organization, ninety per cent of the knowledge coming from outside is not obtained systematically but is mostly provided by human beings being gifted with certain talents which allow them to be « gate keepers » — you might call them « inducers » or probably «inseminators» — because that is what they do.

As stated by Tom Allen it is obvious that the human being has proven to be the most effective source of technical information due to his flexibility and ability to rapidly respond to the user's need.

A dialogue between a man having a demand for knowledge and a man having a potential for knowledge can never in its creativity and selection, nor by time invested, be substituted by an information system, even if it is computerized.

To develop in industry a mind for innovation — for the functioning of individuals as gate keepers, inducers or inseminators, we need to train industrialists in analysing the concept and objectives of their companies, in judging of priorities, beside upgrading and renewing of their professional basic training.

All involvement of the individuals in the procurement and selection of information — available through personal contacts or written sources will imply a continuous professional education and development of the capability for critical selection of that only five per cent of information in existence which, according to the expertise of the staff, is really new.

Nobody outside the organization no matter how well defined a profile is developed is capable of selecting more than documents.

The training of the industrial user of information is, more than anything else, a question of a training in the attitudes towards procurement, selection and application of information; it is not a question of training in information or documentation systems or methods.

RECOMMENDED FOR FURTHER READING

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KJELD KLINTØE was born on 21.3,1916. He graduated in 1941 from The Technical University of Denmark, having a masters degree in chemical engineering Having held positions as technical manager, sales manager and managing director in several sectors of Danish Industry specially graphic arts and film industry 1941-1955, he established DTO, Danish Technical Information Service in 1955, and is still director of this institute, which is affiliated with the Danish Council for Scientific and Industrial Research. He is a member of the Danish Academy for Technical Sciences, the Danish National Committee for Documentation and Information and Danish representative for Information for Industry in various OEEC and OECD committee since 1955; at present member of OECD Scientific and Technical Information Policy Group. He is also Chairman of the FID/II Study Committee « Information for Industry » and Director of Management and Executive Training Programmes of the Association of Danish University Graduated Engineers since 1955.

USER PSYCHOLOGY

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The study of the user involves knowing the mental processes in learning and information seeking. Recent work by Piaget, Guilford, Vygotsky and Luria, in particular, are important in demonstrating how percepts are transformed into concepts by being assimilated into an organized structure of notions. The information user is trying to enlarge his Self by a purposeful search for the missing parts of his own structure, not only by requesting « bits » of information from a store, but also by deriving insight from reading the works of creative writers. Librarians must divert some of their attention from the inward-looking preoccupation with the mechanics of their systems, and look at real-life situations in the light of the actual needs of users.

It is well known that in the last few decades there has been a considerable increase in the quantity of research in many areas of psychology. There has been virtually none, however, on that aspect that concerns the psychology of the users of libraries and information services. This is not so surprising as it sounds; on the one hand, psychologists are not known for their eagerness to study themselves, and the studies on the use of the psychological literature that have been carried out under the auspices of the American Psychological Association have been largely sociological; on the other hand, librarians and information scientists, who might have initiated the studies, are generally what one might call « inward-looking », pre-occupied mainly with the description of their own systems rather than with the analysis of those systems in relation to the larger systems of which they are part. This reluctance to look outward has the result that advocates of the application of systems theory to library and information services actually shrink from a true appreciation of what the theory means; they talk about « black boxes », but their approach is the reverse of the usual black box formula, in that they seem to be only concerned with what goes on inside, and pay little attention to the sources of the input or the effects of the output. Let us by all means recognize this approach as a useful analogy, but let us at the same time recognize both its limitations and its actual significance.

The fruitful application of systems theory consists precisely in this: it visualizes the organization — in our case the library/information service — not as a black box, a thing in itself, self-sufficient and inscrutable, but as part of a wider system, or super-system, and an integral part at that. We need feel no diffidence in claiming that libraries are an integral part of scholarship; the case has indeed already been made on our behalf by Professor John Ziman, in his influential book *Public knowledge*[1] and again in his 1970 ASLIB Annual Lecture[2]. We can certainly consider the library/information service as a thing in itself, a whole, for the purpose of studying the internal relationships of its dependant parts, for its management. But the shape of the service as a whole, the relative importance of the various parts, their different rôles in the service, all of these must be determined by the relations between the service and the outside world, or that part of it which constitutes the immediate super-system. This will usually be the organization which the library serves; for the public library it will be the local community, for the university and the special library it will be the group of scholars, for the industrial library it will be the research workers, whether in scientific or commercial departments.

The sociological systems represented by these various groups are of the first importance. This was emphasized by Professor A. I. Mikhailov and his colleagues in their foundation paper on « Informatics »[3]. It is the social rôle of the library/information service that is the supreme determinant. But the effects of this particular relationship are actually expressed through interactions with individuals - the several users of the service pursuing their own individual aims. These are of course formulated within the context of an organization, and are shaped by the organization's own needs, even, in the widest sense, by the needs of the community which a public library serves. Every library makes its characteristic contribution towards the realization of the organization's aims, but in this context the organization is the super-system, and the individual members have all of them their contribution to make as parts of that system. Indeed, they are the foundation of the system, so to speak, they are the parts, the sub-systems, which stand in relationship to each other, to the library, by virtue of their being members of that system.

These parts are also, however, systems in themselves. They are members of the super-system by virtue of their being themselves, by being the very persons they are; it is for this reason that they have value for the super-system, and membership of it has value for them. They have their own personal integrity; that is, as systems they have their own internal organization of their parts. It is the study of this internal organization that is the task of psychology as a discipline. Here I naturally find myself hampered by the fact that I am not a professional psychologist, with the specialized tools of that trade at my fingertips.

I can claim, however, to have a fair amount of actual experience of the ways of users, in public, special and university contexts; and in my rôle as a librarian in the field of education, I have to be familiar with what is going on in that area of psychological research that concerns learning. This has a very precise significance for all of us who are concerned with information control and transfer, even if we have so far signally failed to take advantage of it. This study on our part is long overdue, and is, in my opinion, a necessary preliminary to the equally if not more important sociological and organizational studies which are now beginning to be made.

Now just as we cannot justify the claim to be applying systems theory if we simply consider a library as a static unit in isolation from its parent organization, neither can we reduce user psychology to the consideration of Man as an isolated static unit. We all live in, and are integral with, a dynamic, evolving world. But before we can fully interpret the relations between library and user, we have to stand back from the real world and consider each in turn. It is sterile, as Engels pointed out a century ago in his polemic against Eugen Dühring, to fall into the metaphysical mode of thought, « the habit of considering objects and processes in isolation, detached from the whole vast interconnexion of things; nevertheless », he went on, « in order to form an adequate conception of things, we have of course to study them in detail », and « in order to understand these details, we must detach them from their natural and historical connexions, and examine each one separately » [4].

The greater danger, the existence of which is amply testified in our professional literature, is that we shall study our user as an individual who impinges on us; in proper behaviourist fashion, we shall examine him as no more than a source of stimuli for us. We shall regard him as a black box, and instead of studying the internal working of his mind, we shall pay attention only to those outward and visible signs of his mental activity as they appear to us and affect us. If we do this, we shall not be studying user psychology, but librarian psychology. We must, for the moment, detach the user from his natural connexion with our service and study him as an individual in his terms, not ours. What is his milieu? What are his aims? How does he come to have a need for a library or information service? What is he doing, in his own view, when he uses the literature of his field? This may very well be somewhat different from what we imagine he ought to be doing. It was not for nothing that Socrates regarded the precept « Know thyself » as the most difficult to follow, and we are all too apt to regard our user as if he were part of the bibliographical apparatus and a rather secondary part at that. We need constantly to remind ourselves that the bibliographical apparatus, like the library and information service itself, exist for the sake of the user and not the other way about.

There are several facets to the study of the user, and we can call the first, after the manner of Professor Ranganathan, the Personality facet. What thought-processes go on in the mind of an individual to determine his courses of action? Miles of library shelving are doubtless occupied with attempts to answer this question but, most baldy stated, he is trying to form an organization of concepts that will help him to understand his environment and master it so that he can live more efficiently. This does not merely mean mastering the physical aspects of Nature, though that is basic. It means also acquiring a greater understanding of the human condition, a deeper sympathy for his fellow-men and their predicaments; from this, he acquires a fuller understanding of himself. I introduce this aspect very deliberately, because I believe that the application of information service methods should not be confined to science and technology, but should be extended also to the humanities and the social sciences; surely the transfer of knowledge and wisdom are every bit as important as the transfer of mere information?

We have, then, to apply ourselves to the question, how does an individual form concepts in the first place, and how does he organize them into a pattern that is coherent, that makes sense to him? There have been many studies of these processes, though we do not find much reference to them in our own professional literature (and, in return, we do not find much about information services in the psychological literature, despite the American Psychological Association surveys). There is a great divide here, which ought to be bridged. But we shall only be able to show the value of an information service in a convincing light if it can be seen to be directly related to the processes going on in the mind of the user, and not if it is presented as an exhibit to be admired and even wondered at, but not usable in any way that has an immediate appeal. The KWIC index, to my mind, is such an exhibit; it is certainly a wonderful example of the bibliographical cleverness of computers, but as a tool for the searcher it is so primitive as to earn only a bad reputation for those librarians rash enough to recommend it.

Fortunately, the process of learning how to form concepts has been studied both widely and in depth; one may mention in particular the work of Piaget[5], Vygotsky[6] and Luria[7], and J. P. Guilford[8], as having a special pertinence for our own profession. Their work, as well as that of many other experimental psychologists who have repeated their experiments and devised their own, shows that concepts do not come into the mind fully formed, nor are we equipped with some innate mental mechanism, permanent and unchanging (as is claimed by Chomsky)[9] by means of which we not only can, but must, process sense data in a certain way. It has been shown over and over again that each individual comes to transform information given by his senses into knowledge in his own way, by means of his own activities; and since the history of the activities of each individual is unique to him, each individual is himself unique. This uniqueness extends to his store of knowledge: none of us knows exactly the same as another.

Nor, in the learning process, is information inscribed on the child's mind as *tabula rasa;* failure to learn is no longer attributed to mere idleness or to hatred of the teacher. We learn to form concepts by actively operating on the world around us, by experimenting with combinations of operations, by putting things in order, and by observing differences in the way things behave. Both Piaget and Vygotsky have emphasized that the awareness of differences precedes the awareness of similarities. This is important, since it represents the beginnings of a realization of the value of classification, without which we could not even begin to cope with the world. It is only after we have, early in our lives, acquired the skill of differentiating, of classifying, that we come to know the highly significant fact that, after all, we do not always have to acquire information through our own sense perception: we can actually learn by reading, by consulting documentation. This realization comes almost entirely through our mastery of the skill of classification, because it is through this that we discover that, by assuming that objects which possess certain properties that we associate with a class of objects may also possess other properties that we associate with that class, we can predict the future behaviour of those objects, without actually having to perform experiments to find out. This, of course, is the whole basis of our own professional claims for the value of information services in modern society, because it also follows from this that we can rely on « second-hand » information, that is, information that we read in the writings of others.

Percepts, then, are integrated into a coherent pattern by being processed in the human mind into becoming part of an organized structure of notions. They are trasformed by this process from what Vygotsky calls « spontaneous concepts » into « scientific concepts ». They become scientific by virtue of their being assimilated into a coherent and pre-existing pattern of other concepts in the mind of the percipient. Through the process of assimilation, he comes to understand the new percepts, they make sense to him. If they are not assimilated, they will have no significance for him, and will consequently be ignored. When Pasteur said that « Chance favours the prepared mind », he meant that the pre-existence of a pattern that can accommodate new percepts in a coherent way gives the percipient the chance to take advantage of the chance appearance of new information. And as we know, the Princes of Serendip were so successful in taking these chances that they gave the useful word « serendipity » to our vocabulary. It is because we recognize the experience from our own past activity that we appreciate the value of the word.

These pre-existent patterns of notions, somewhat like the jig-saw puzzle, have their own integrity: the parts fit together and we are satisfied with the result. Unlike the jig-saw puzzle, however, the patterns of thought in our minds are always capable of being modified by the assimilation of new experience. As Bronowski has pointed out, Man is part of Nature, and is different from automata, not because of some « vital spark », but because each man, though endowed with the same set of chemicals, develops into a unique self which is constantly enlarged by its own experience; its mode of action is an integral part of its mode of knowledge, turning experience into self [10]. Being predictable (as we are more or less) means not being unpredictable; it does not mean being an automaton. This ability to become progressively modified is the foundation of creativity.

Creativity, in art or in science, consists in the ability to present data in a light that had not been perceived before, but which nevertheless fits into this kind of coherent pattern in the minds of the audience. It may be the presentation of familiar data in an unfamiliar fashion, as, for example, with a new interpretation of a play of Shakespeare or a piece of music by Beethoven. It is usually, in science, the presentation of new data in such a manner that they can readily be seen to fit in with the accepted pattern - the « paradigm », as it is called by T. S. Kuhn [11]. At moments of crisis in science, on the other hand, the new data are seen to provide an explanation for discrepancies, for those experimentally observed phenomena which are not accounted for satisfactorily by the paradigm. At such moments, scientific revolutions occur and the paradigm is overthrown and a new one becomes accepted. For the creative scientists, an information service should therefore aim to provide both the knowledge of the paradigm and the awareness of the discrepancies.

Creativity, then, implies that the consciousness — the self — of an individual has been enlarged in a manner that has hitherto not been communicable, for however much it may be claimed that the truly creative person is indifferent to the process of communication, it is by communication that we judge creativity. The « mute, inglorious Miltons » of Thomas Gray's village were inglorious precisely because they were mute. Creativity, like Science itself, is a matter of public consensus. But the essential feature of creativity is that it communicates the enlargement of the self to others; it makes them more aware of the significance of phenomena for themselves and not merely of their significance for the artist, the creative person. A creative presentation is therefore not merely a matter of description: as Wordsworth says of the far-from-creative Peter Bell,

A primrose by the river's brim
A yellow primrose was to him,
And it was nothing more.

A creative presentation, on the other hand, whether of a scientific experiment or a piece of beautiful scenery, is a matter of interpretation. The fact that the scenery appears beautiful is explained: its organization, the relations between its parts, has significance that is more than private to one individual. It can be assimilated into the structures existing in the minds of others. It does not, therefore, remain simply as something to be learned by rote and repeated parrot-fashion without understanding.

Hence the fallacy of confusing information theory with information science or Informatics. Information theory is not concerned with meaning, only with the transmission of messages. A parrot can be taught to transmit a message, but we do not say that parrot understands what it says; it merely utters sounds. Information service is very much concerned with meaning, of course; hence the importance of relevance, of pertinence, and of user psychology. We cannot attempt to eliminate redundancy, for example. We have to present a picture of a particular area of knowledge and of its surrounding areas as well, in trying to establish, in consultation with a user, just what he knows already, what sort of pattern he has in his mind, and what information he needs, and can assimilate, to complete the picture he is trying to form. He needs clues from the surrounding areas; they form the bridges by means of which he can arrive at an understanding of the new information.

The user of a library/information service is trying to enlarge his own consciousness by a purposeful search for the missing parts of a structure of knowledge that has significance for him. He also wants to be sure that he can remember these missing parts when he has found them; he has to retrieve them from the store that is his memory. There have been many studies of this operation also in recent years and a school of thought now exists which pays great attention to the rôle of structure and organization of concepts for the purpose of good recall. Bruner, for example, says that « perhaps the most basic thing that can be said about human memory, after a century of intensive research, is that unless detail is placed into a structured pattern, it is rapidly forgotten »[12] Several series of experiments, by Mandler[13], and by Wortmann and Greenberg[14] (confirming Mandler's results), have shown how the organization of words into categories with hierarchies forms a powerful aid to the memory; it helps people to think.

This brings us to the second facet of the study, the Matter facet. What material does the user have to work on? If we say « information », what exactly do we mean? Once again, I should like to emphasize that it is not merely factual information, or data, that concern us. A user does not go to the text of *Hamlet* for the facts of the case, of which Shakespeare had actually only a sketchy notion. We do not simply ask questions of Tolstoy or Balzac. We certainly go to their works in a spirit of enquiry, but what we are looking for is what we might call « insight »; the imaginative interpretation of aspects of the human condition. The rôle of documents, of graphic records, is to preserve what a writer of some ability has thought worth presenting for public scrutiny and judgement. Science, as Ziman says, is public knowledge. The author writes of things as he sees them; he may write of the world of facts, he may well write with a particular readership, a particular group of people, in mind. But he still writes of things as they seem to him. What the user wants, however, is what will be pertinent to himself as a user of documents. The social rôle of the librarian and information scientist is to act as an organizer of both documents and of the information they contain. It is true that we are not concerned, generally speaking, with evaluating the worth of contents in relation to their subjects. But we are very much concerned with the assessment of relevance and pertinence, and we have therefore to give consideration not only to arrangement and indexing (techniques of the highest importance, of course), but also to at least some aspects of presentation of material. The making of abstracts, surveys, reviews, is definitely part of the information service that aims to provide its users not only with what they need but also in a form in which they can easily assimilate it.

This is sometimes called re-processing, or re-packaging, and there is some justification for this expression. But we do have to beware of the influence of the market place. Some of the biggest disasters in the history of information services have been brought about by the introduction of the philosophy of mass production, that the more we produce the better, that every consumer can be satisfied with the same article, and that what is easy to produce must of necessity be equally easy to use. This line of argument resembles the « information theory fallacy ». The normal situation facing an information officer is that he is dealing with a unique human being with his own unique needs. However much those needs may have been determined by the needs of the organization served, however much we may claim that science is objective and not to be distorted by the subjective imagination of the individual, nevertheless we cannot escape the fact that each individual is unique because the context of his thinking is based on his unique history. The most effective information service is that which is specifically devised for each user, based on his known needs.

This is the philosophy that should motivate research into the techniques of documentation. It is the philosophy that lies behind the work of the British Classification Research Group, for example. We have been impressed by criticism of traditional forms of classification schemes, such as DC and UDC, useful though they have been in their time. We are now trying to follow the pioneering work of Ranganathan, who has said, « the whole history of classification is a history of breaking rigidity », and whose theory of facet analysis and analytico-synthetic classification has freed classification schemes from the rigidity of the single « Porphyrean » hierarchy. Our work has attempted to parallel current discussions among philosophers, in all fields, on the nature and structure of knowledge. What we have set out to achieve is a theory of a general index language, which can be readily applied, with modifications as necessary to any specific situation [15].

With respect to the Energy, or Operations, facet, we are in a somewhat different situation. I certainly subscribe to the view that part of the business of Informatics is the study of the production and publication of information; we have ignored this aspect for far too long. I believe, too, that we can, in our professional capacity, offer useful advice to an author on some aspects of the presentation of his material. I doubt, though, that we can do this insofar as it has to do with individual psychology; it is more a matter of mechanics: style and layout, forms of citation, and matters of that sort, rather than the way in which a writer, as a user of a library, treats his material. What is directly relevant is how the user acts in using the service, not the results of the service, the information he acquires.

This depends entirely on his motive. We read constantly in our professional literature complaints of the « apathy » of users, how they will not take advantage of the splendid facilities that this or that library has to offer. And it is undoubtedly true that natural indolence operates far more against the satisfaction of the needs of the mind than of the body. But we can at least identify some needs of the mind and consider how the user may wish to call upon documentation to help satisfy them.

The first, and probably the most serious of these, is the need to form habits of thinking that will enable the individual to deal with the data provided by his senses. An education system aims to meet this need. There is indeed some truth in the old saying that a man's education is what he has left after he has forgotten everything he learned at school, since this does underline the fact that education is not the patient memorizing of masses of facts (testable by examination), but the transformation of the mind into a precision instrument capable of coping with the problems posed by everyday life. Since most of the shape of the external world is produced by Man himself, this process of education has been called « initiation » by some modern philosophers, after the analogy of traditional ceremonies that turn the child into an adult in primitive societies. Through our education, we get to know the details of natural phenomena, the facts of the case; we form concepts by incorporating these details into a structure which makes sense, and by doing this we attain a mastery of the skill it represents (just as we may attain the mastery of occupational skills by practice); we develop an understanding of the nature of phenomena, we form habits of thought and speech that give us the ability to predict and foresee the course of events, so that we are not taken by surprise by what happens each day. Chomsky has drawn attention to the curious fact that even a small child who has only a partial mastery of language can easily understand sentences that he has never heard before; it is because they conform to a recognizable pattern which he has acquired the skill to interpret.

Having gained this skill in using our brains, then, we have to find material to use it on. Information is this material. It consists of those data given to us by our senses which we recognize as belonging to some mental picture that we have, which is incomplete. We may not have known that it is incomplete, but we recognize that the new data have significance for us. Information, *per se*, may be of overwhelming importance for information scientists, but do not let us fall into the error of thinking that it occupies the same lofty station for most of our users. They are much more concerned with the state of their own minds.

It is for this reason that recreation is important for us. By this, I do not mean simply relaxation. I mean that refreshment and restoration of the human spirit which is vitally necessary if the mind is to continue to function positively, if it is not to become jaded, negative, uninspired. This area of human need is, of course, notably the business of the humanities, but is just as worthy of the attention of Informatics as is the matter of information processing.

Now the motivation of users depends very much on the extent to which a library/information service can demonstrate ease of access. I say « demonstrate », rather than « provide », because I believe that simple provision is not enough by itself. Users must be made aware both of the provision and of the ways to use it. This means much more than competence in service, though this is a *sine qua non.* It also means nearness, comfort, a congenial atmosphere. Access must be related to patterns of use. This sounds too banal and commonplace to be worth mentioning, but even this can be forgotten. Some years ago, a great new library was built for a British university. The architect, describing his creation, called it « The Laboratory of the Arts », and upon this entirely worthy notion based his decision to place the library centrally to the Faculty of Arts, at the other end of the campus from the Faculty of Science. In this, he showed a complete ignorance of actual modes of use. The library may well be the laboratory of the Arts, and members of that Faculty use it as such; that is, they go there prepared to sit and work for several hours, or days if necessary. The scientist, on the other hand, usually goes to look up some specific datum; he may be in and out in a few minutes. Which of these will be prepared to take a ten-minute walk to get to the library? The answer is obvious; if the scientist does not have the library near at hand, he will not use it. He will demand (indeed, has already demanded!) a special department library next to his laboratory.

This anecdote illustrates how necessary it is for the information service to be seen to relate its activities to the real activities of users, and to give them a positive service specifically made to suit their needs. Years ago, professional discussions were very much taken up with the question of circulating periodicals. When the phrase « selective dissemination of information » was invented, it was hailed as a revolutionary new concept which would greatly improve information service for users. So it has; it has without doubt enabled many libraries, like my own, to give a personal service which we could not otherwise give. But let us not forget that, for the user, it is inferior to the circulation of the periodicals themselves. We all know this; which of us would give up the privilege of having new issues delivered to his desk for the alternative of SDI cards or copies of Current Contents? Our own practice as users, rather than as information scientists, will tell us what is likely to be psychologically acceptable to other users.

All depends on how the library/information service seems to relate to the real needs of the users. In order to study this problem, we must leave the inward-looking preoccupation with the minutiae of mechanisms for doing this or that process and look at real life situations, their possibilities and our own shortcomings in relation to them. An information service is not, or should not be, merely a fine thing to have, to show important visitors. It should be an integral part of an organization's life, just as information itself is integral to the life of an individual. If only a small fraction of the resources wasted on using vastly expensive equipment to process great quantities of rubbish had been devoted to outward-looking research on the real needs of users, we should have no more need to complain of their « apathy » in using our services. This is a confession of failure and it is perhaps the education of ourselves that should occupy our thoughts before we presume to start « educating » our users. Perhaps I can exemplify what I have been saying, not by transferring a bit of information, but by quoting a piece of poetic insight that will illuminate this particular aspect of the human condition. It is Robert Burns who speaks, in Scots:

> Oh wad some power the giftie gie us
> To see oursels as others see us!
> It wad frae mony a blunder free us,
> And foolish notion.

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FIRST STEPS IN USERS TRAINING

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Intellectual habits are acquired at an early age. Therefore the training of users of information should start already in elementary school and continue throughout school life. It should begin with readers guidance, instruction in the use of libraries and general reference tools at the elementary and high school and culminate in familiarizing the student with special sources of information and use of sophisticated retrieval systems at the university. A general layout of the training program from the 3rd grade of elementary school up to graduation from high school is outlined.

Information transfer is a two way process. If on the receiving end there is no eager and interested acceptance the whole structure of information transfer is apt to become meaningless. The best trained information worker can do very little if his services are not sought after and not made proper use of.

The perception that not only the information worker must be trained in his profession, but also the user in the art of seeking and accepting information, is of relatively recent cognizance.

The reasons for the necessity of training the user seem to be twofold. The sheer bulk of printed matter pouring out from the printing presses day in and day out are liable to make the potential user suspicious of the quality of the printed material, and generates a subconscious resistance to reading. The second and probably the most telling reason is that the educational networks of most countries to-day do not develop the ability of intelligent reading from an early age and do not emphasize the use of the printed word as a primary source to acquire knowledge.

The realization that the potential user is not trained and not prepared to receive and assimilate the services of information workers has stirred some higher institutes of learning to introduce shorter or longer courses of users training into their undergraduate and graduate programmes.

How very inadequate these beginnings are is best reflected in the statement by W. Piròg[1] in his review of existing facilities for users training, that « courses for users exist in fourteen countries only ». Even if allowance is made that these figures apply to 1970, and that probably some sources were overlooked, this number is amazingly low.

What is still more amazing is that among the fourteen countries listed only Poland mentions casually that « experimental lectures on scientific information are also organized in some secondary and vocational schools », and East Germany that « a few years ago the Ministry of High and Professional Schools introduced a sixteen hour course on information and documentation as a regular and compulsory subject ».

In most of the other countries it seems that users training, if practised at all, is practised either for university students or members of the free professions only.

In to-day's technically oriented world a high level of adaptability to new ideas and techniques is required from everybody, so that the term « user of information » cannot apply any more to the post-high-school educated only, but has to embrace members of every strata of society.

It can be taken for granted that any person entering a profession to-day will not be able during his life span to base his work on the knowledge acquired in the years of his initial training only. If he does not possess the skills and the mentality of a «user of information», he will be helpless in the face of the changes to be expected during his lifetime in the general structure of society as well as in his particular field of endeavour.

The literature which has evolved during the last decade on the subject of user training emphasizes mainly training in the use of scientific, technical and economic literature for university graduates, and is mostly of a descriptive nature.

Only very few peremptory statements have been made with regard to what is to be aimed at and what can be expected from users training.

H. Ziegler[2] from the Central Institute of Information of the German Democratic Republic is one of the few who have tried to outline an integrated plan for users training on all levels. But although he quotes: « The basic law on education in GDR stipulates that the unassisted learning of pupils has to be encouraged above all by their introduction to techniques and methods of brain work by the utilization of modern information media », he does not go any further than to require that: « basic knowledge on scientific information is to-day ...part of obligatory general education; the imparting of such basic knowledge has to begin already at secondary schools ».

Whereas nobody will disagree with the first part of this statement it must be borne in mind that intellectual habits are acquired at an early age, and therefore, to be successful, the training in the use of printed media should be started as early as possible and be regarded as one of the primary tasks to be performed by elementary schools.

It should also by no means be restricted to the use of printed matter in the scientific or technological fields, but should be made the key to the rediscovery and assimilation by each generation anew of our cultural, artistic and literary heritage.

Especially to-day, when the use of audio-visual aids is penetrating more and more the school programmes, resulting in a certain intellectual laziness and the habit of acquiring information with a minimum of mental effort, the training of pupils in reading in depth is of paramount importance.

It is less important to impart to the young child some additional bits of factual knowledge, which are anyway liable to be superseded by the time he finishes his schooling, than to train him in the use of tools for acquiring knowledge and thus equip him to keep abreast with the cultural, social, scientific and technological changes and developments which will probably take place during his lifetime.

Unfortunately, after the problem that our generation is not trained in the use of recorded knowledge began to be recognized, the approach to its solution was casual and haphazard.

In recent years some scattered articles on particular problems of information transfer or on some sources of information were published in medical, chemical and engineering periodicals. Some colleges and universities introduced shorter or longer courses in the use of sources of information, mostly subject oriented. However, the student who enters a university is already at an age when his mental habits have crystallized. If among them the instinctive and immediate turn to recorded information for the solution of a problem or simply for the enrichment of his cultural background is lacking, these courses may not build up a habit of the use of printed matter in general, but only impart some sketchy bits of knowledge about sources of information in a particular field of study.

The problem has to be tackled much earlier and much deeper. The child has to be initiated in the art of intelligent, discriminating and conscious use of printed material from a tender age. This alone can raise the standard of general education, stimulate intellectual curiosity and train students from an early age in self reliance and independent thinking. If this practice is generally adopted, colleges and universities will receive a much higher type of student — one who has already acquired the habit of using printed media as a tool for study and intellectual advancement. The training in the use of recorded knowledge at university level could then be profitably confined to sources of information in a specific subject field, according to the student's specialization, whereas this approach, if practised as it is to-day, with students who did not have the benefit of basic and systematic training in the use of literature at school level, remains ineffective.

In the very interesting research project on reading skills of elementary 5th grade pupils, undertaken by a group headed by Florence

Cleary of the University of South Florida,[3] one of the conclusions is that the test group of children which benefited from the reading guidance programmes developed more emphasis on reading and inter-action with friends as opposed to TV viewing and attendance at movies, and revealed more mature daily wishes and interests. One of the recommendations of the report is: « reading guidance programmes should be started in the 1st grade (6 year olds) ».

Although the author of this paper is in full agreement that reading guidance of elementary school pupils is the first step in information users training, it seems that guidance should start when the child has already mastered the mechanical skill of reading and can concentrate on the intellectual content of the reading matter. Thus in the 3rd grade (8 year olds) a class period per week held in the school library and taught by a specially trained teacher-librarian or librarian-teacher should be introduced in all elementary schools, and the informal use of the library and the borrowing of books should be encouraged.

When graduating from elementary school the pupil should be already familiar with:

- Practice in locating books on shelves
- Use of catalogues
- Principles of book classification
- The construction of a book; its various parts and what sort of information can be gleaned from each of them. (author, editor, title, publisher, year of publication, foreword, contents, bibliography, indexes).
- Alphabetizing and indexing
- Use of standard reference books
- Arrangement and use of dictionaries
- Arrangement and use of encyclopedias
- Arrangement and use of maps and atlases
- Information about, and visits to public libraries in the region of the pulpils' domicile.

In the junior high school the pupil should be introduced to more sophisticated aspects of information sources:

- Kinds of books: fiction, textbooks, monographs, reference books, yearbooks etc. — (object of each group, when and how to use them).
- Newspapers; their various sections (editorials, political, economic, literary art, theatre and music).
- Periodicals and serials (layout, object, comparison of their content with the content of books).
- Biographical works of reference.

In the senior high school the pupil should be made acquainted with:

- Government publications (their object and use)

- Non-book material: reports, dissertations, films, microforms, records, audiovisual aids, etc.
- Secondary publications; their object and use
- Bibliographies; their characteristics, object and use
- National Library, university libraries and important special libraries of the country. National and international organizations concerned with information work.

The presentation of the material by the teacher in all its stages must aim at the greatest possible involvement of the pupil. From the very beginning of the programme the pupil should be made to use his newly acquired knowledge through projects and written assignments on specific subjects. The written assignment on topics commesurable with the intellectual development of the child should aim not only to make the child articulate, but to teach him a systematic and disciplined approach to intellectual work. A pedantic adherence to an agreed form of his essay, (form of the title page, introduction, contents, bibliography, indexes etc.) should be aimed at.

When such « user of information » programmes are introduced in elementary and high schools, the universities will get an articulate student used to independent work and thinking, and be in the position to concentrate on the more sophisticated areas of intellectual development of the student, and in greater depth on the teaching of subject fields of his choice. To-day precious time is wasted at the institutes of higher learning, imparting to the students knowledge and habits which they should already possess when embarking on a university course.

Programmes of users' education as continued at the university level, will then be able to concentrate on sources of information in specific subjects, and the more sophisticated techniques and methods of gathering and assimilating information. To-day, these subjects when thought about at all, reman in the mind of the student unconnected with his study and work, an additional unwanted burden which does not add materially to his intellectual and cultural advancement. To those who do not continue their education immediately after graduating from elementary or high school it will give the tools for retraining in a profession of their choice at a later date, and those who do remain in their chosen profession, to keep abreast with new developments in their field during the whole period of their professional life. It will also make everybody a more involved and responsible citizen, as he will be able to approach every new social and cultural manifestation with greater understanding.

Two conditions are indispensable for the success of the initial users training:

1. Training librarian-teachers or teacher-librarians for the task of educating the information user by introducing into their training programme instruction hours to familiarize them in depth with

the subject and its methods of instruction. For the benefit of those who already work as educators, special courses should be run to help them to discharge this new task satisfactorily.

2. It should be impressed upon the educational authorities of the country that every school, elementary as well as high, should have adequate library facilities with reasonable premises and stock and in charge of a professional. The child must be exposed from the very first day of entering the elementary school to the atmosphere of a well run and well stocked library. At this habit building age the first impressions of the importance or non-importance of the library as a primary tool of acquiring knowledge will remain with the child throughout his life.

It is a good sign that the problem of users' education has began to worry the members of the intellectual community. Until now, however, very little has been done in this respect, and the beginnings which have been made are unfortunately not in the right direction. The users' education has been started where it should actually end — at the university level. Let us not squander the opportunity created by the awakening realization of the necessity of users' training, as long as the ideas, habits and traditions in this field have not yet crystallized, but start users' training systematically and right from the beginning.

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TRAINING OF USERS OF INFORMATION

by
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Training of information users is essential - both from the economic and academic point of view - for further progress of science and technology. The Moscow State University was the first to have established an inter-faculty chair of scientific information in the 1963/64 academic year. The course is divided into three parts: Sources of Scientific Information, Retrieval of Scientific Information, and Use of Scientific Infrmatoin. Programmes in infomatics, varying in size and cnotents, have been introduced at a number of Soviet institutions of higher learning.

Progress in world science and engineering has been unequalled during the last few decades. The volume of research has been growing fast, accompanied by a steadily increasing mass of information publications.

An important feature of modern science and technology is a sharp cut in the time-lag between a scientific discovery and its realization in practice.

Another feature of present-day science is the rapid growth of multi-branch problems that can be tackled only by a great number of scientists of different specializations. For instance, exploration of outer space, transplant operations could serve as examples of such problems. Traditional systems of scientific links are no longer valid for the solution of such problems. Information service rendered to scientific research is getting more and more complicated. An ever-increasing integration of scientific disciplines creates an acute need for new methods and means of disseminating and retrieving scientific information. Scientific information work is rapidly becoming an independent branch of science. This means, above all, that an ever-greater number of specialists, is engaged in the latter, and only in the latter branch of science.

This could only have happened once scientific information service had assumed a mass character and a great number of people had been directly involved in scientific work.

In view of the immense costs and complexity of research, in order to maintain high rates of scientific progress, an urgent problem of raising productivity of scientific and research work work must be solved. Better organization and wide application of mechanization and automation in scientific work must also be ensured.

Scientific and technical information is an organic part of any single piece of research, facilitating the acceleration of the overall scientific and technical progress. Its goal consists in ensuring the speediest possible transfer of information both in science *per se* (in one area or between some related ones), as well as in providing international links between science and other fields of human endeavour whose progress largely depends on timely and comprehensive information.

A major means of increasing the effectiveness of scientific work, along with refinement in organisation and methods of conducting research, and the creation of modern information systems and application of cybernetics machines, is mastery of scientific fundamentals in informatics.

Of course, success in scientific information activities, as in any other, is conditioned by the availability of specialists trained in a specific area of knowledge. A high degree of efficiency in this area of activity depends, in the last analysis, on the possession by the users of information of the art of finding and using the knowledge that has been accumulated by the preceeding generations.

Teaching this art is a problem which is most frequently formulated as the need for training information users within the national higher educational system.

Thus, scientific and technical information can be effective *if proper care is taken of two aspects*:

1) the training of specialists that serve the information networks,

2) the training of information users.

It is the training of information users in the URSS that makes up the subject of the present paper.

Training of information users is a major concern not only in the USSR but in many other countries.

Higher schools have been incorporating at an ever-increasing rate the goals of information user training in their programmes. This is not accidental.

The teaching of the fundamentals of information activity — informatics being the discipline which studies the laws of this activity — will do more than merely increase the proficiency of graduates. It will help to overcome the internal difficulties which arise in the higher education system, i.e. ever greater amounts of academic material must be digested by the students. The number of academic hours, however, is limited and insufficient with the growth of academic matter. Therefore the methods of teaching must incorporate modern methods and means, in particular programming teaching and use of computers.

The knowledge of the fundamentals of informatics, the primary and secondary documentary sources, the information service system, and the skills in finding and using the information needed, facilitate the capacity of students to digest bigger programmes within a limited period of time.

There's another point. The process of using scientific information is part and parcel of scientific creative work and, in a broad sense, can be considered as a sort of dialogue of the scientist with the information system. The fostering of the know-how of conducting such a dialogue is the very essence of professional education which we call we call training of information users. That is the reason why it is necessary to acquaint students with informatics as an independent scientific discipline, with the laws governing the information process, and give them a general idea of the IRS theory, coordinate indexing, methods and means of analytical processing of information, mechanization and automation of information work and other problems of informatics.

Training of scientific information users is a major nation-wide need. Being a leading institution in scientific and technical information, VINITI devotes a great deal of attention to training lecturers for the course « Sources, Retrieval and Utilization of Scientific Information » destined for information users.

The Moscow State University was the first to have established an inter-faculty chair of scientific information in the 1963 - 1964 academic year. One of the purposes of the chair is to acquaint students of natural sciences with the methods and means of scientific information. For undergraduates of the natural science departments, an optional course of lectures is made available.

The course is divided into three parts. Part I which is entitled « The Sources of Scientific Information » sets down the development stages of documentary records, the typology of primary scientific documents and the laws of their distribution, and ageing; the principal kinds of secondary scientific documents are considered: handbooks, abstract journals, bibliographic aids, and the library catalogues, the traditional and new types of indices. The concluding section of this part is devoted to an overview of the organs of scientific information and special libraries, as the auxiliary establishments of science.

Part II of the course, entitled « Scientific Information Retrieval », explains the basic principles of information searching, and the information retrieval systems of the conventional and descriptor type, as well as the technical facilities for their realization. The lectures give an insight into the problematics and the general concepts of information retrieval, the IR languages of the alphabetic and the subject systems, hierarchical and faceted classification, coordinate indexing and the principles of building descriptor languages. They offer practical suggestions for using library catalogues, document indexing by UDC and punch-card file preparation.

Part III of this course which is entitled « The Use of Scientific Information » is given over to the methods of copying and multiplying scientific documents and to the various questions involved in the content of the scientific information activities. A description is given of the principal groups of information users, types of information requirements, and their study techniques, and the problem of evaluating the efficiency of information services, as well as their future prospects.

A principal syllabus of the course for searching and application of scientific information at the Moscow University Chair for scientific and Technical information includes both lectures and laboratory work.

The course has been translated and is being printed in English and German.[1]

The introduction of a new discipline into higher education, notably the universities, poses a number of questions, the most difficult and disputable one being that of the content which should be taught to the future information users. We maintain that it should not be limited to applied knowledge only, but be extended to the theoretical background as well.

The work of teaching informatics is carried out by special chairs established at institutions of higher learning, which combine staff training for scientific information work with the of information users. Experience has shown that these chairs often become centres of research in informatics, and serve the needs of the research and academic process of the institution as a whole.

Programmes in informatics, varying in size and content, have been compiled at a number of Soviet higher educational institutions: the Moscow and the Leningrad Culture Institutes which graduate special librarians; the Moscow Institute for Historical Archives Work; the Kuybyshev, Tallin and Riga Polytechnical Institutes; the Tomsk Institute for Radioelectronics and Electronic Engineering, and some others.

To sum up, the above considerations may have shown that correct and timely training of information users is essential — both from the economic, and the academic point of view — for further progress of science and technology.

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For bibliographical note see page 107.

SESSION II

Training of Information Users

SUBMITTED PAPERS

NEED TO PROVIDE SPECIAL INSTRUCTION FOR INFORMATION CLIENTS TO ENABLE THEM TO TAKE PART INTELLIGENTLY IN INFORMATION SYSTEMS

by
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This paper analyses the information clients of governmental and private services and the special instruction needed to enable them to share intelligently in the information system. Four levels of information are identified for four categories of users. The conclusion is reached than an optimal education programme must be developed in order to optimize the use of information by the consumer. The types of courses hitherto provided to meet the needs of the masses and of individuals are listed and reference made to the training of « documentalist-correspondents » from groups of technicians or organizations using the Italian Defence Technico-Scientific Documentation Centre.

The three primary needs for technico-scientific information systems in the future may be summed up, in my opinion, in the following three points, formulated by one of the largest American complexes handling this type of activity for the benefit of the whole of the U.S.A., namely, the Defense Documentation Center.

1. The quality of existing or future technico-scientific information must be improved.

2. The information customer must be interested in the organic planning and functioning of the information systems in order to be able, in his own interest, to make the best use of them.

3. The benefits that can be derived from these services must be quantified in real terms, so that these systems can be based on concrete elements and not on purely theoretical statements.

In my short contribution I shall dwell on the second of these points, not only because it comes within the general subject of this interesting meeting, but also because of the increasing importance that must be given to the information client, to enable him to make a better and better use of the government and private information services that already exist or will be set up in all countries with a certain level of technico-scientific development. I shall deal first with some salient points regarding the relationship between documentation centres and clients, and conclude with a brief reference to what it is planned to provide in the documentation service now being formed within the National Defence, to facilitate the « dialogue » between the following two basic elements of any system aimed at solving the information problem:

a. Information clients cannot all be considered at the same level, therefore their education regarding the handling of information cannot be the same either.

b. The identification of the users in an information system and therefore the criteria regarding the level of education to give them is of the utmost importance.

At this point I would identify in a data/information managerial system four levels of information.

1st Level: This is directed, almost exclusively, to users who take many initiatives in the research for data to meet their own particular needs.
Such clients may require a system that reflects the functional needs of the acquisition of crude data and their mechanical processing (storing, transformation, transmission).
The 1st level users, a highly specialized group, comprise individuals who are the initial receivers of the crude data necessary for starting and then continuing a certain activity (for example, the crew of a space craft) or for carrying out a particular very sophisticated research (for example, a research leader and his staff).
The system must not so much research for these people as they must research for the system.

2nd Level: This level already presupposes a processing of the raw data and is directed to clients comprising refined, sophisticated interpreters of the data and of summaries of research reports.
A management system at this level reflects the individual needs of the users, but it must at the same time be able to be of use to a much wider range of individual users or groups, as the information data are increasingly disseminated and become more and more accessible. The 2nd level users may be identified as professional personnel, laboratory colleagues of the 1st level users belonging to professional associations and to specific study groups forming part of government organizations and private companies.

3rd Level: This level handles information already completely processed, accessible to increasingly larger numbers of technicians and students, so that increasing demands are made on the system as regards dissemination and the material to be found, catalogued, and stored.

Clients of this level may be students of universities or colleges, graduates pursuing specialist studies, members of professional, technological and educational associations, etc.

4th Level: This level must handle information for users who, in general, are not self-motivated in their research for data. The group of users of the 4th level is potentially the most difficult to manage, and is also the most tricky from the point of view of their needs.

The task of producing transfers of information useful for this level of clients is therefore quite different from that relating to users of higher levels. For example: in the U.S.A., although the scientific and technological applications resulting from the American space programme have been decisive for the progress of mankind in general, the knowledge of the great mass of the population (who must be considered a user in general for any information) of the advantages obtained has been insignificant.

In view of the foregoing, I would regard the users of the 2nd and 3rd information levels as those particularly to be educated for a better use of the work done by information centres.

Since the clients of the 1st information level are at once information producers and clients, they will not be considered here. The insertion of them into any information system is automatic because of their own work requirements, and therefore a knowledge of the sophisticated techniques for information handling must be taken for granted in their case.

For the clients of the 4th information level, which comprises the great mass of the nation, the need for a special education, for each individual, is less important and may be replaced by dissemination through convenient mass-media, audio-visual techniques, to convert the user from a passive to an active information handling agent. For example, the identification of the users at this level and then the stimulation of them to become active agents, could be done by means of specific market analysis procedures or also by a systematic programme of supplying information and educational material through the enormous range of the primary social organizations (Rotary Clubs, cultural clubs).

Clearly, the classification of the users according to the levels described above must not be regarded as a final division of the various classes of users. A particular individual could be a user of a given system at more than one level or even at all the levels. Nevertheless, the classification of the users of information systems into the levels indicated above furnishes a systematic means for examining all the population of the users, and can therefore provide some guidelines on the education to give them so that they can take part adequately in a data-information transmission system. However, what I shall say below about the education of the users refers to those whom we could classify in the 2nd and 3rd levels.

At this point I should like to make a further consideration on the development of the managerial qualities with which the leaders of the society of the future, which I would term post-industrial, will have to be equipped.

These leaders should be able:

- to handle technical, psychological, and social problems at the same time;
- to communicate with and direct scientists, engineers, accountants and artists;
- to use sophisticated tools for more and more venturesome planning and for decision-making at the highest levels;
- to understand and use systems valid for mass social neeeds and for individuals.

These needs show that the leaders and executives of the future will have to be experts in many disciplines; since they will have to use new methods and techniques; probably multiple careers will have to be encouraged in the future. The possibility of multiple careers necessitates a wide competence for utilizing an extensive mass of information.

From the foregoing it follows that:

« An educational programme must be developed in order to optimize the use of the information by the consumer ».

The solution of this problem is not easy, since in training the user to handle documentation competently, in the special field he is interested in, it would be unwise to aim at a degree of professional specialization that would turn the user into an information scientist.

Since the training of the user can be started at various stages, it would be essential to determine the characteristics of these studies.

The attempts made hitherto in this sector have been directed both towards those that meet the educational needs of the masses and towards those that cater only for the needs of an individual:

- short courses conducted by State and regional centres;
- courses at colleges and universities;
- courses in secondary schools;
- courses of professional associations;
- courses of of professional institutes;
- consultant firms;
- lessons given at home;
- private lessons.

Courses for undergraduates and graduates can give a training that ensures:

- an information system that meets the user's needs;
- a group of users who know how to use the system.

Courses in secondary schools represent another means of potential training of the user to the level of an average capacity necessary for the acquisition of efficient information.

Collective professional courses, courses of professional symposia, and technical demonstrations furnish a means of instructing the user in subjects of specific disciplines and in methods and procedures.

As regards the education of the user, the organization of the Defence Technico-Scientific Documentation Centre now being developed in Italy by the Ministry of Defence, in collaboration with the Italian National Research Council, has aimed at training « documentalist correspondents » belonging to groups of technicians or to organizations which are users of the Centre.

Such persons, appointed by each of the groups of information users, can form inside their respective groups a service of information experts, who are thoroughly acquainted both with the user's needs and with the possibilities of the Centre and the way in which it functions.

These documentalist correspondents will follow a course lasting a month at the Centre, by which they can become sufficiently expert in the procedures used by the Centre in information handling. In this way a first attempt has been made in the Defence National Research Council Centre to solve the important problem of educating its users.

GEN. GIOVANNI ARCIPRETE was born in Naples on 5.12.1910. He graduated in civil engineering at Naples Polytechnic and in naval and mechanical engineering at Genoa Polytechnic. An Officer in the Genio Navale (Corps of Naval Constructors) from 1938 to 1972 he reached the rank of Lt.Gen.G.N. He took part in the Italo-Ethiopian war as an artillery officer, and in the wars of 1940-43 and 1943-45, collaborating with the allies in the M.M. He holds two war crosses for military valour. A specialist in the technology of advanced materials, among the various posts held during his military career, for the last ten years he was Head of the Scientific Liason Office between the Ministry of Defence and the National Research Council and Director of the Centre for Technical and Scientific Documentation of the same Ministry, which he set up as the first automated centre in Italy for the processing of scientific information. Since 1972 he has been Consultant to the Defence Ministry for the processing of technical and scientific information.

OBJECTIVITY AND SUBJECTIVITY IN INFORMATION WORK

by
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As long as men were convinced that what from to time forms the content of our thoughts and is expressed in speech was the reflection of the « reality of the facts that surround us », the problem of the objectivity of information was reduced to the attainment of this « reality » which is, in fact, unachievable. Science and philosophy would at any rate have provded for this. However in science and philosophy this presupposition has been greatly weakened since we have become increasingly aware that thought and its content are the result of our own mental operations. Studies for the planning and construction of the so-called intelligent machine, the models of the mind have given the coup de grace to the presupposition. Will everything then be subjective? Will we have to abandon the distinction? The greater knowledge we now have of our mental operations convinces us to the contrary. In effect, we speak of objectivity as the result of some very clear procedures of which it is sufficient to mention: a) when the meaning is transferred from man to an instrument; b) when the point of view is stated preliminarily (so that the meaning is placed in relation to this and no longer to the person expressing it; c) when we achieve a new meaning thanks to the introduction of a variable which is shown to have been omitted previously.

In a school of information, dealing with information collection, transmission, reception, diffusion, etc., I consider that one of the first chapters should be devoted to the old problem of the distinction between objective and subjective.

For thousands of years men have been discussing around these two terms, to safeguard themselves against the partial, the prejudiced, and so forth, in the context of a problem complex that opposes the true and the false, the real and the apparent, the absolute and the imaginable, the subjective and the inter-subjective, the sincere and the mendacious, the frank and the reticent, up to and including the scientific and the empiric, etc. Interest in this distinction is even greater in modern times, with the spread of information. Man lives more and more among symbols, names, and less and less among the things symbolized, the things named; his is an iconosphere. Information starts from and reaches every part of the globe, and very soon from and to other places. Quicker and quicker, more and more economic and rich, it reaches into man's home and encroaches on his privacy. The written word has been joined by the spoken word and finally by the image, first in black and white and two-dimensional. Electromagnetic waves pass over and undermine the notions of territory and even of civilization. An interest in information which economic and ethical ends revive in a sometimes vying tangle of information and communication, propaganda, political and religious, education, and public relations (we will see later how they are distinguished one from another).

On occasions, when I am present as a maker of models of the mind, of translating machines or those that observe and describe, not a few persons confront me precisely with this hope, of an objective that in itself will once and for all impose itself on all men: that of the machine. « If only the machine could describe, judge! ». Unfortunately, the machine too, could not go very far towards satisfying our requirements and indeed if the separation between objective and subjective, between true and false, became rigid, as we shall see, it would not be modelled on man, it would not reflect his history.

Nevertheless, it is due to the studies of the mental mechanisms needed to make the construction of these perceptive, thinking machines gifted with linguistic capacities conceivable, that we have had to abandon a certain ingenuous attitude towards the objective and the subjective, towards the true and the false.

This attitude led to the belief that our mind reflected a reality or nature existing in itself, metaphorically exterior to us, and always in itself thus arranged as our mental contents arrange themselves from time to time. We, it is said, reflect them through a metaphorical knowledge, destined to transfer them from that exterior to a no less metaphorical interior, just as they are, but devoid of any physical nature, that is, as abstract entities; and hence, if the duplication were faithful to them, we would have truth, objectivity, etc., or otherwise error, appearances, etc.

Undoubtedly, this presupposition was jolted, sometimes profoundly, in the 2,500 years of philosophizing behind us, but without eliminating it at the root, and rather in a hundred ways silencing the insoluble difficulties which it raised, passing from a dogmatism — i.e. from thought or assertions offered as universal or necessary, although unjustified — to scepticism, i.e. to thought or assertions considered as gratuitous.

Anyone preparing to construct a machine that observes and describes, on this presupposition, should in fact immediately change his mind, and not because he ought to transfer to the subject some indiscriminate operation, but the precise operations which in man's case lead to observation, thought and speaking as we do. With just one basic difference: that we can operate even without being aware of how we operate and even of being operative, whereas the machine, i.e. the one who constructs the machine, can certainly not fail to have this awareness.

Let these few examples suffice. (See page 417).

The drawing in fig. 1 can be said to be composed of bottles or else glasses. But is this possible without in one case leaving white for black and in the other black for white? And when we follow the line of separation, what are the itineraries and the stops in the two cases?

Thus in perception there is a holding and a letting go, which do not precede the thing perceived, but come in to constitute it, and so in the case of a figure there is a shifting of the attention, here too with movements and stops that do not precede the figure, but come in to constitute it.

Another example is given in fig. 2.

Here we can talk of a square, a rhombus, a parallelogram, etc. But it is clear that from instance to instance the thing thus called is made up of different figural movements. There is nothing certain pregiven, subsisting in itself and as such transferred to our minds.

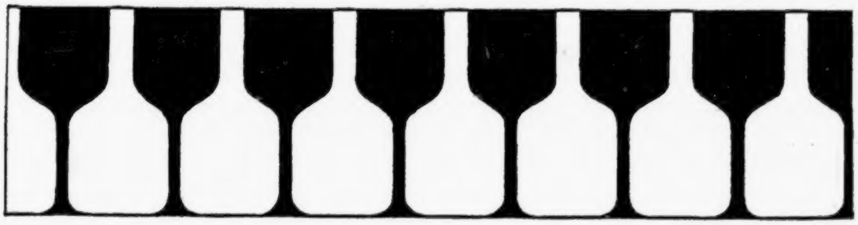
As regards my last example fig. 3, is this something in the singular, which we can call « wood », or something in the plural, « trees »? Apart from the operations of perceiving (holding and letting go, etc.), a singular or a plural, wherever would they be found if not in the operations with which we constitute them prior to applying them to that which is perceived?

It is quite impossible to construct a machine that observes and describes things without a preliminary analysis of the operations performed by us. And this holds not only for bottles and glasses, and suchlike, but also precisely so that it will use as we do words such as « objective » and « subjective », « true » and « false », and so on.

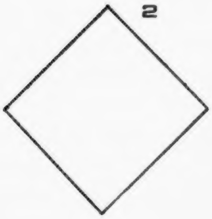
What, then, are these operations?

First and foremost, if knowing cannot consist in that shifting of things from a metaphorical exterior, where they would themselves be unknown, to a metaphorical interior, our brain, where they would become known (and, among other things how could such a comparison ever be made between an unknown and a known? Indeed, how could it ever be known that the known represents not itself, but other than itself?), what are the operations that are actually performed when we talk of knowing?

« Knowing Paris », knowing latin, tennis, Mr So-and So, etc » means that since we have already operated in a certain way, we are able to repeat that which we have done. We are thus able to walk about Paris, where we have already walked, to translate from or into Latin, which we have studied for years, to recognize Mr So-and-So, who has been introduced to us and with whom we have spoken. Nonmetaphorical knowledge designates a temporal relation between two



1



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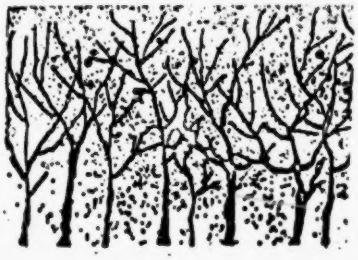

things both present, it refers to a repetition; and it is in this repeated action, and in the comparison between that which one has done the preceding time or times and that which one does the subsequent time or times that we find that which enables us to speak of objective and subjective, true and false, and so on. The initial action is not enough, but only the second, whether this is the simple repetition of the first or its enrichment. We will see how.

We glance out of the window, or listen to the sounds, or we simply imagine or bet: « it's raining outside ». If that were the end of it, viz. it were no longer possible to operate, to intervene, to repeat what has been done, then the assertion-thought-observation would never be either true or false, nor could a question to this end have any meaning. If it is acquired, it should be possible to look afresh, to listen to the sounds again, to add perception to the imagination, perhaps enrich the action by leaving the room, stretching the hand out of the window to see whether it gets wet or not, examining the ground, etc., etc.

Now, if the results of the second action are equal to those of the first, the first assertion-thought-observation will be considered true, that of which one speaks real, and otherwise false, and that of which one speaks apparent.

We are in the field of things physical, but even if the example referred to things psychical, the procedure for the distinction would be the same. A control would be made of « my first upper molar hurts », « I'm no longer in love », etc.

Naturally the work of control, of demonstrating, can always recommence with a truth and an appearance, a being and a seeming, which thus always remain open, historical. Thalidomide? It is an effective, safe drug for expectant mothers. This, until fresh evidence shows it harmful, transforming the former assertion to falsity, and the benefits into mere appearances. It is not different in the case of calculation.

A « 3 x 3 = 12 » would remain thus, outside of the framework of values of truth and falsity, if there were no possibility of repeating the operation, the proof and the comparison between the old and the new action: from the repetition of the operation, the comparison with the multiplication table, to the substitution of the multiplication with the addition of), etc. And then the judgment. No, it is wrong: « 3 x 3 = 9 », « 3 x 4 = 12 », etc. The judgment can bear on any part of the first part of the first calculation and the operation itself: « 3 x 3 is not 6 », but « 3 + 3 ».

The repetition may be improvised or in keeping with rules, theories or more or less rigid practices; and so the true and false are joined for example by the right and the mistaken, the right of rightness, naturally, and not of justice. These terms are therefore used mainly in the fields of mathematics, linguistics, games, and partly also in measurements, etc., where declared rules are necessary. In fact, if « 3 x 4 = 12 » is thought about not as true, but as right, one tends to take into consideration not just the product, but the whole expression. When the right is proclaimed for example by an assertion-thought-observation such as « it is raining outside », we note that the stress shifts onto the assertion, the correct use of words, recognized specifically as applying to that situation. Nevertheless, if control of the designation comes via resumption of the thing designated, especially if this consists in an analysis of its characteristics, then one easily returns to the true and the false: « He is a true man », « He is a false prophet », etc.

The objective and the subjective continue this problem, i.e. theory and practice of the repeated action and comparison of the results, with one comment. So far an operator, a subject, and an operand, on object, have not opposed one another as parties concerned in the action. It has rather been between joint elements, while distinguishing true and false of the assertion-thought-observation and real and apparent of the asserted-thought-observed.

Now, however, the operator, the subject, enters the lists, separating two situations: one in which the subject does not appear, to oppose it to one in which it is present.

By way of example, let us take a statement of wet and dry, found by the hygrometer, when the speaking-things-observing subject of the instrument is removed, and the same statement when it participates explicitly, for example with an « I hear », etc., or implicitly.

However, it then becomes a case of a distinction between objective and subjective exempt from evaluation, precisely because we limit ourselves to doing it in the name of this presence or absence, without drawing consequences and above all without assessing time. Both when the subject from a certain aspect can be substituted by an object, for example in the case that he and the scales make a pronouncement on a weight: « it's 100 grams », he and a counter, on a number: « 23 people have gone past », and suchlike; and when the subject is not replaceable since it figures also as object, with its physical or psychical nature (the famous impossibility of knowing others, which would give rise to a contradictory attempt), for example in the case of the first upper molar that is hurting.

The presence of the subject, a recognized presence, which again brings up the distinction between the objective and the subjective, slotted onto that of the true and the false, the real and the apparent, takes into account the more or less rich action of the subject. This, on re-examination by others or even by itself of the action that would have led to that result, would not have taken into account one or more influential elements. The preceding action thus acquires a negative value, of subjectivity, partiality, etc., compared with the subsequent one, which acquires the positive value of objectivity, impartiality, equity, etc.

Here is an example: « I had always considered my cousin to be an egoist; but I was not being objective, because the people he has met in life bear him out », and suchlike.

This distinction, too, can be constantly reviewed, transferring the objective to a subjective in favour of a new objective, on the introduction of a new element, which shows that it has been neglected. It is in fact clear that one can never speak of the influencing elements being exhausted. When one speaks of « the whole » or « all », this requires a list to have been drawn up first, and it is only in relation to this that one gets the whole or the part.

The criterion opposing the objective and the personal is a little different, since in this case the presence of the subject is permitted with its irreducible originality. One who states that he is speaking « in the first person » can no longer be accused of being subjective or partial, but no more can he be awarded recognition for objectivity.

In this problem complex of the true and the false, of the subjective and the objective, the evaluation not of that which can be observed or can be taken back to a coherency already established, as in mathematical calculations, but of that which regards mental categories and their applications to things observed, is however certainly more intriguing due to its philosophical origin, with its presuppositions of reality or nature to be duplicated in us. One instance has been seen in the drawing that can be regarded in its singular aspects as a « wood », or in its plural aspect as « trees ».

We possess a fundamental mechanism for mental life, that of the attention.

We owe it to our attention if the functioning of other organs is made present to us mentally. Take the pressure exerted at this moment by the feet on the shoes and by the shoes on the feet, or the heat exchange between clothes and the skin, or the air we inhale and exhale, etc. All these things take place without our being aware of them, i.e. at a vegetative level, until, as has happened at this very moment, we turn our attention to them.

The attention fulfils a second function: it fragments the functioning of these organs insofar as it makes it present. Thus there is a certain construction, the pressure between feet and shoes, which started precisely when the attention was directed toward it, but which ceased, too, as soon as it was taken away; and hence the fragment. These fragments vary in duration from a tenth of a second to one and a half seconds.

But the attention fulfils a third function, combining several states of attention, thereby giving rise to about 2,000 combinations, which are used either singly, or applied. This is the case seen with the singlular and the plural, merely present when spoken of in grammar, for instance, but applied in « tree », « trees », « wood », « woods » etc. And again, to keep to the example already given, in the perception, to be able to leave and retain that which has already been pointed out (the case of black and white, of glasses and bottles, etc.).

Now in addition to composing the things observed, these categories are added to everything else as contents of the thought effected through it. For example, if we apply one of these to the fingernail, it will look like the beginning of the finger; three fingers of water in a bottle can be seen as all the water, as part of it or as the rest of the water; a car accident, as an effect (the driver's lack of skill) or as a cause (of the infirmity to the driver), etc., etc.

In these application of categories there is certainly the intervention of certain dependencies, certain enslavements, but these cannot in any way be obligatory. Categories constitute an enrichment of the situation, but at the same time, once expressed, they orient, polarize the way of seeing, of considering things. They also constitute our attitudes, including the scientific and the magical, the ethical, the aesthetic, the economic, the religious, the political, that of work and play, etc.; some score or so attitudes by which we turn to the things observed, which, to the extent that they respond to that which the attitude requires of them, are utilized positively or negatively by them, according to about forty values.

How can these application be included in the true and the false, the objective and the subjective?

One example will suffice. The use, through the application of a mental category, of any state or process whatever as a term of comparison, as a paradigm, turns it into a law. But what state or process to choose? In the case of the motion of bodies, for example, straight or circular motion, or both (Aristotle)? Certainly it is not possible to speak of true of false, of objective or subjective, about law, about a singular or plural, etc., as applied to one thing or another one in particular. At most we can speak of abundance or economy of choice, according to certain criteria.

Nevertheless, without any awareness of the mental operations from which the things named stem, it is quite possible for one using them to consider one has found them like that, simply opening the eyes to reflect on the supposed reality or nature, interlinked as our thoughts are, from instance to instance.

Also because so far this has always happened, perhaps giving rise to discussions, questions without an answer, unless the persuasive force of one party silenced the other party's thought and word.

Faced by this situation, I see just one remedy: for whoever thinks and designates to be aware of his mental constructions, of the attitudes assumed and the consequent values, and for him to declare them. And if this does not happen, for at least the one receiving the designations and thinking to be aware of them and be on his guard.

This is the objective regained through the interpretation of points of view. If we are entitled to assume that which we prefer, we also have the duty to declare it.

The world of observations, of categorizations, of attitudes, of values, of thoughts and of words meanwhile rises to the level of information. I no longer choose them just for myself, but to diffuse them, that others may repeat them; and thus this diffusion can have objectives ranging beyond mere diffusion and which should, to respond to truth and falsehood, objectivity and subjectivity, proper to the scientific attitude even at the level of everyday life, also be declared. They are the rules of the game, those which make bluff legitimate or illicit, for example.

I refer back to a list of these objectives I have mentioned, distinguishing one as information, one communication, one publicity, one propaganda, political or religious, one education and lastly one as public relations.

Information is whatever is transmitted symbolically in order to be received symbolically. If the receiver did not already perform the operations thus designated, at least momentarily he will modify his mental behaviour, and perhaps his psychic and physical behaviour. But the one giving the information does not bother about its fate. He informs and that is that. The use made of it does not concern him.

In communication there is more. It is supposed that something remains to the one transmitting, but is also taken over by the receiver. For there to be communication, it is necessary in fact for something to be shared between the two parties; and for this to be a matter of concern.

Publicity comprises the assertion of certain values, the offer of that which satisfies them and the commercial nature of the latter.

Propaganda also asserts certain values and hence promotes the behaviour that satisfies them, but proposes nothing that can be exchanged on a commercial basis.

Education is characterized by the transmission of mental, psychic, physical action, which can and must be repeated by those who receive it.

Lastly, in public relations it is seen how the values of others are already present in those communicating them, or can become so. You are with us to come with us.

Obviously, the various ends will give the types of information different contents and will also cause different ways and different means of transmission to be chosen, which will take into consideration the various audiences for whom they are destined.

Unfortunately, the demand is not easy to meet. The various aims are often mingled, are often all the more efficient the more they are contaminated and camouflaged, and they frequently stem from and enliven antithetical freedoms, antithetical responsibilities, etc.

In the diffusion of information, certain alternatives can but appear tempting. One is lying. That is, one arrives at the thought in a certain way and that is the thought that ensues. But it is overturned into an opposite thought, and this alone is designated and transmitted. Another is silence. That is the thought, but it keeps silent in whole or in part.

Lastly, there is the choice that is discriminating at the outset. The camera, movie cameras are alluring and ferocious. It is not possible to take everything in the sense of freedom of observation, of the direction of the attention such as is present in every individual when no limits of space and time are imposed on him. But partiality is not declared and by some it is not even noticed.

Once again, may the attitudes guiding the choice reached be declared.

If, in a school dealing with information, the promotion of an objectivity of information is seen in this awareness of mental action and in this declared responsibility of assuming an attitude, then an instrument of guarantee over and above scholastically educated awareness and morality socially diffused would also be obtained through a new language, in which words were accompanied by an index (suffix, prefix, infix, etc.) which revealed the operative origin by classes: things observed, relations, values, and so forth.

PROF. SILVIO CECCATO was born Montecchio Maggiore (Italy) in 1914. He is University Lecturer (Libero Docente) in Theoretical Philosophy. After studies in jurisprudence and music he turned his attention to research in aesthetics which he subsequently extended to the field of methodology. At the end of the war he settled in Milan where his methodological trend assumed an increasingly operative direction with a programme for the identification, analysis and description of mental operations. This led to the founding of the reivew « Methodos » dedicated to the problems of language and cybernetics, which reflected the interest of the group of scholars that he brought together in the « Scuola Operativa Italiana » and which collaborates with the Centro di Cibernetica e di Attività Linguistica of Milan University. In 1955 he constructed in collaboration a mechanical model of mental operations. In the meanwhile he sought to apply these results to the problems of mechanical translation, collaborating with the American Government and EURATOM. He is now engaged on constructing a machine capable of observing and describing the events of its environment. He teaches Applied Linguistics at Milan University and from 1960 he has directed a National Research Council Group for Cybernetic Research. He is a member of the Governing Board of the Milan section of the Associazione Nazionale per l'Automazione and forms part of the Consultative Committee of the Reviews « *Mechanical Translation* » (MIT), « *Foundations of Language* » (Holland), « *Dialectica* » (Switzerland) and the Series « *Etudes d'Epistemologie Génénetique* », Presses Universitaires de France. Silvio Ceccato is Editor of the Review « *Pensiero e Linguaggio* » and among other works, he is the author of « *Cibernetica per tutti* » (Milan 1967) and « *Corso di Linguistica Operativa* » (1969).

THE USE OF TECHNICAL INFORMATION - THEORY AND PRACTICE

by
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The paper considers the problem of stimulating users, above all, technicians in medium and small firms without documentation services to seek information. Various methods of providing essential information in quickly absorbable and acceptable forms are outlined and the author's experience in applying these methods in firms described. An account is given of the promotional efforts of certain Italian organizations to provoke awareness of the need for continuous updated information and three essential points suggested for its achievement: sectorially specialized documentation centres, support for the centres by promoting organizations and through co-operative methods, the sale of information on the principle that something bought is more highly valued than something gratis.

I have confined my paper to a discussion of the theme of Session II since the problem of the professional training of information specialists covered in Session I, has already been discussed in other important organizations such as UNESCO and FID and the various solutions that can be adopted are essentially a matter for governments and depend on their political will.

If we desire to have documentalists at university level it is necessary to introduce the teaching of documentation in various faculties and departments, something that has not even been adumbrated in the university reform now being discussed in the Italian Parliament.

Here I should like to emphasize that I have deliberately referred to documentation not informatics which is a technique which the documentalist can make of use of in the same way as a bibliography but which can never prevail over the former.

Granted then that the education of documentalists does not depend on the will of individuals but on a political will at legislative level, I propose to consider in particular the problems concerned with the use of information which depends on the wish of potential users to be informed.

Hence the problem can be divided into three parts:

1. The capture, processing and conservation of information.
2. The choice of the most suitable systems for the dissemination of information.
3. Stimulating users to ask for information.

As I shall try to show, the third point is to my mind the most important because everything, in the last analysis, depends on the user's desire to be informed. We have proof that the users in need of certain information do not seek it and are deaf to receiving it even when an effort is made to encourage them with all the most easy and attractive systems.

Television is a very powerful organ for information but if the user has no real desire to know, he does not listen and switches off the programme.

Unfortunately the same occurs with technical information.

I have deliberately separated the scientific from the technical notwithstanding the fact that technical applications depend on scientific research, because the scientific user or the researcher user is the one who has perhaps the least need for information since he is more inclined to documentary research and the consultation of texts, reviews and abstracts forms part of his daily work when he has not obtained prior information by way of the usual exchanges of information that take place among the scientific elites.

The person who has the greater need for information is the technical user particularly at the level of medium and small industry.

All the three parts into which I have divided the problem of information for technical users imply certain conditions for their implementation.

As regards the research, processing and storage of the technical information that must serve the users in medium and small industries, it must first of all be accepted that the technicians, unlike scientists and researchers who by their vocation are involved in speculative work which needs re-thinking, pauses, testing and re-testing, live the tempestuous life of the firm where productivity is the categorical imperative. Whereas the scientist can to a great extent ignore the economic component of his work the technician has to keep it constantly to the fore.

The technician has little time to engage in bibliographical research or the reading of documents, hence it is essential not to smother him under a mass of documents that he will never get around to examining but to choose a very limited number that are of immediate interest to him.

I personally have carried out some experiments in industry of various sizes and kinds: in the glass, mechanical, wood, textile and clothing sectors.

The first was to circulate among the technicians periodicals dealing with their sector, but we soon realised that circulation was slow and the hold-ups occured with those very technicians who had most need for the information they contained, but who neglected them because they were absorbed in the day to day work of their factory. Very often we were compelled to collect from their desks piles of unopened reviews.

We obtained some slight improvement by marking very clearly an article that might be of special interest or better still, attaching to the review the title and a brief summary of the article in question.

We were also able to provoke a certain interest by circulating bulletins with brief notes on the contents of documents. In many cases these did arose interest and bring a request for an original document.

To sum up; what is needed is limited information, shrewdly selected and summarized.

But if this information must be sieved from a much greater mass, how and where are we to store the vast quantity of momentarily unused material whose actuality nevertheless could still be valid in a more or less near future?

The ideal solution would be for every firm to have its own documentation office where all the information and documentation regarded useful to the firm could be processed and stored by conventional means (card indexes and classificators) or through the use of computers.

But this, for, reasons of cost, space and personnel can only be achieved by the major industrial complexes.

Are the medium and small industries, then, to be condemned to non-information or to be badly informed at second hand or through far from disinterested marketers of techniques and products?

This is the focal point of the entire problem of information.

Since, and it is well to repeat it, it is in fact the medium and small industries that have the most need to be informed, and indeed informed in good time, not only to enable to keep up with but even outpace the major industries as regards innovation and so beat competition. Thus there arises the need, where documentation centres in the firms themselves do not exist, to establish and run information institutes, that can serve (even in a co-operative form) industries, not only in the same sector but also in different ones.

In my paper I have not taken into consideration the documentation centres of state or para-state organs nor those that serve major industrial groups.

I shall limit myself to mentioning the three institutes that have carried out or still do carry out documentation services on behalf of requesting or potential users.

They are AMMA (Associazione Meccanica Metallurgica Affini of Turin), IDAMI (Istituto di documentazione dell'Associazione Meccanica italiana of Milan) and CIB (Centro Internazionale Bibliografico of Florence).

The AMMA is active, the IDAMI has been destroyed, and its millions of card indexes are now rotting in the damp cellars of Milan University and the CIB only survives thanks the hospitality of ENAPI, whose Director General, Ing. Mei is also Chairman of the Italian Association of Documentation and Information and a convinced supporter of the importance of documentation.

In point of fact it is only AMMA and CIB that are capable of providing effective technical information and perhaps in Italy it is only the CIB, inspite of all the grandiose computer projects that have been mooted, that is able to present a notable mass of card indexes of real utility without having elaborated or discussed any philosophy of information.

The information they contain is such that would be of great use to the users in the medium and small industries. But how is it to be made available? This brings us to the second part of the problem: dissemination.

Perhaps this is the most difficult aspect because it is so intimately bound up with the need to stimulate an awareness of the vital importance of information in potential users. Various solutions suggest themselves, some of which are listed below:

1. The supply of the original document;

2. the making of an abstract;

3. bibliographical indications;

4. document anaysis and listing the items extracted in a bulletin.

The support used, whether photographic, microfilm or printing, is of little importance. What is on the contrary important is to know how they are received by the users.

I have experimented with the various forms listed above and even some combinations of them, but have not been very satisfed with the results. They all prove to be too laborious for the technician if they force him to undertake a search, since what he needs is a clear and simple presentation of the information that interests him at a given moment. This, then, is the reason for the limited success of the circulation of many periodicals, abstract bulletins, bibliographies and repertories.

But, on the other hand, we live by information with which we are bombarded at every moment of life. How then is it possible that those engaged in productive techniques are to survive without it:

It follows that the only way out is to tackle efficiently the third point of the problem, that is to say, the stimulation of the user.

In this field, in Italy, ENAPI can claim to be in the van with a series of meetings it has organized between 1947 and the present time ranging from « Technical Information in Firms » (Florence, 1967) to « The function of Information for Company Development » and « Technical Information in Furniture Manufacture » (Bologna Fair, 1968 and '69) and, this year « The National Meeting for the Study of relations between Technological Research and Small Firms » (Turin - Salone Tecnica). In the autumn of 1972 AIDI and ENAPI will organize a meeting in Florence on the « Market Document », that is to say the product, the manufactury and the raw material considered as a living document. This meeting will, it is hoped, bring together a large number of business men to consider the problems of documentary information and will serve to form a new entry of users of information.

All these meetings as others promoted by AIDI and INIP have revealed the need to instil among the medium and small industries a conviction of the necessity for continuous and updated information.

But how can we achieve this?

I consider that we must, above all, concentrate on these three points:

1. Sectorial specialization of Documentation Centres.

2. Assistance to these Centres on the part of promoting bodies or by establishment of co-operative forms.

3. Provoke a request for information and to sell it since something that has to be paid for is always valued more highly than something that is given away.

In order to provoke a request for information, a wide-ranging campaign of persuation will be necessary which must include direct talks and small informal meetings.

At a formal meeting one is lucky to bring together five per cent of the persons concerned, hence it is infinitely more valuable to assemble some five specially selected persons who have received a personal and oral invitation.

I am the last to want to gloss over the difficulties of this method but at the moment I can see no other practical alternative.

I could perhaps suggest another idea: when we produce information we assume to some extent the rôle of publishers and we can attempt to adopt their systems in the sale of our goods. Publishers have come to recognize that apart from booksellers, catalogues and folders one of the most effective means for the placing of books lies in the personal visit of a representative or agent, particularly if it is a matter of organizing deferred payment.

Why should we not create our own team of agents and allow firms to take out a subscription on deferred rates?

However, we must recognize that in the same way that in this type of marketing the publisher must be in a position to offer a wide and varied range of books, so the documentation institute must have an efficient organization and be capable of offering a vast range of information services.

I can only end by expressing the hope that this Conference will have some practical suggestions to make so that so many outstanding papers will not have been discussed in vain.

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THE ENGINEER AS RELUCTANT INFORMATION USER—A REMEDIAL PLAN

EUGENE B. JACKSON,
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Despite the existence since 1900's of special industrial information services, there is a lack of appreciation for the engineering use of information by the rank and-file engineer. A recent example is the failure of the proposed United Engineering Information Service to get financial support from the profession. All undergraduates in engineering must be reached on the value and sources of information. The mechanism suggested is via unitized TV-cassette presentations prepared by graduate library information science students and distributed to requesting engineering professors via a clearinghouse.

Libraries have long been a part of major engineering research and development organizations. For example, your author has had the privilege of heading two government agency aeronautical engineering libraries each of which pre-dated 1920; also an industrial automotive engineering library that was from the same era and finally had staff responsibilities on library and information retrieval matters for a computer manufacturer whose eldest laboratory library dated from 1933.

Characteristic of the earliest phase of these libraries was the management selection of a non-professional person to handle the inquiries that started bubbling up from the pioneering inventor and machine-design « types » forming their clientele. Through accident or happy instinct, a number of these early self-taught librarians, so casually hired, managed to identify so closely with the needs of their organization that they stayed productive for thirty-forty years and became active in professional library association activities besides.

The next phase began in the 1940's when professional librarians or subject specialists were hired to head engineering libraries. Through professional societies such as Special Libraries Association and ASLIB these librarians/specialists developed co-operatively reference tools and forums that led to a higher level of performance and an appreciation of the contribution of information to the engineering solution that was more highly developed than that of engineering managements of that time period.

The third phase can be said to date from 1961 when the Engineers' Joint Council's President Landis « urged the engineering profession to increase its efforts to obtain effective use of published information »[1].

The ensuing EJC Committees, on which your author served, proposed programmes leading to an engineering profession-wide information centre, training procedures in data processing technology for practicing engineering and — a topic important to today's discussion — inauguration of a major new programme to teach engineering students how to use information resources[2].

By 1965, the EJC had an action plan for a national engineering information centre based in part on existing services such as the Engineering Societies Library and Engineering Index, Inc., both located in New York. The plan called for use of natural language, vocabulary control, source indexing, subject term co-ordination and system compatibility[3].

A Tri-partite Committee composed of the senior officers of the above Council, Library and Index was formed to pursue these matters and with the aid of National Science Foundation and Engineering Foundation grants (one governmental and the other from the private sector) a survey was made of the probability of industrial support of a national engineering information centre and what it should specifically be and do[4].

About this time, word was being passed that informal sources of information for practising engineers were proving to be more efficient and useful than existing formal sources. Further, that their information needs varied by function and task assignment, among other considerations[5].

Your author was a signer of the ensuing Tri-partite Committee's « Action Plan for the Establishment of a United Engineering Information Service » to be based on a non-profit independent membership corporation with the following scope:

> « The UEIS will 1. provide a point of focus and a unifying force for the engineering community with respect to engineering information and data resources, 2. help to train and educate engineers and managers in better use of information resources, 3. study users' needs, 4. develop improved methods of information transfer and demonstrate them, 5. aid and encourage others to improve their information products and services, and 6. furnish certain information products and services for which there is a demonstrated need and means of support. The Action Plan does not provide for referral services or the inclusion of Engineering Societies Library or Engineering Index »[6].

This Plan failed to be implemented due to lack of widespread financial support. There was a firm feeling shared by the Committee that engineering managements still were not really convinced of the utility of information for the accomplishment of their mission.

As a consequence, the Board of Directors of Engineering Index unilaterally in September 1970 drafted a proposal for a five year « Transdisciplinary Engineering Information Program » to be submitted to the National Science Foundation, aiming at the efficient creation of a multi-use data base of engineering information.

The first phase of this projected transformation of Engineering Index (to take over some of the abandoned national engineering information service centre functions) was approved by the National Science Foundation this June in the form of a $ 185,000 cathode ray tube/computer typesetting project for production of copy for the present printed indexing products[7]. In other actions: Engineering Index has used the advisory committee device for the last eighteen months to get knowledgeable input from its fifty highly selected information-concerned trustees. Further it has stepped up its exhibit programme at professional conventions, such as that of the American Society of Engineering Education. It has commissioned a packaged presentation for section meetings and similar small groups of engineers and has made available sample magnetic tapes of its monthly abstracting service to library and information science schools to acquaint them with the work. Emphasis has been on *ad hoc* presentations tailored to the specific audience.

In spite of these activities, the EI trustees still felt as recently as April 1971 that they could not pass a Board-sponsored proposal that Engineering Index assume unilaterally the mandate for providing *the* information system for the engineering profession.

Determined to elicit « grass roots » support for its programme and products. EI's Marketing Staff has just prepared a thirty-six page brochure entitled « EI, the Organization - the Service » covering its who, how what, why and future[8].

There must be additional steps taken to convince the rank-and-file engineer of the urgency of the effective use of information as an engineering tool and they are needed in several levels of organization.

The thread through Phase Three emphasizing the place of undergraduate instruction in information use by means of a concerned faculty convinces us that Phase Four of development must be the provision of instructional aids for undergraduate engineers that are unitized, convenient, interesting and concentrated units. If these units are developed and produced by near contemporaries they will have an added impact.

The thesis of this presentation is that the engineer's historical non-appreciation of information use can be obviated through TV-cassette presentations on unit topics produced by graduate library/information science students under the direction of concerned faculty and carefully imbedded at appropriate points in normal engineering courses. A mosaic of available presentations may be compiled by clearing houses such as the one presently conducted by the American Society for Information Sciences on contract to the U. S. Office of Education. Graduate library/information science faculty members would be responsible for maintaining the quality level of units submitted to the clearing house.

Why can this programme be executed now and not previously? 1. We have better knowledge of the classes of engineering information used — scientific information, management information, engineering data, and processes and procedural information. 2. We know more about the specific media used - catalogues, manuals, standards, specifications, drawings, engineering-change documentation, test documentation - in addition to the time-tried books, periodicals, preprints, etc. 3. We know more about the breadth of information required. 4. We have a larger body of graduate students in courses in the bibliography of science, indexing and abstracting services, and in information dissemination, in both conventional and non-conventional schools of library and information science. 5. We have a student body impatient with routine term paper assignments who desire to see the end usefulness of their efforts. 6. We have some library science faculty members with industrial experience. 7. We have simplifying technology available whereby mixed media may be easily combined to form effective presentations[9]. 8. We have an engineering profession re-examining its goals and emphasizing breadth and social consciousness in addition to depth. 9. We do *not* have the funds to inaugurate this program of TV cassette building in engineering information use.

Hopefully this conference will lend visibility to the concept and your discussion will aid in sharpening the plan and developing persuading rationale to influence prospective funders. It's now a shared idea - let's get on with it!

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TRAINING THE BUSINESS INFORMATION USER

by
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The creation of information from data threatens the business executive's status, pride and security. The specialist-educator must be highly sensitive to the business user's emotional reaction to information. Realization by the information specialist of this situation will dictate an educational process consisting of equal parts of classic dialectic procedure and emotional selling of information system benefits.

The information specialist who is to train the business information user must understand the political, economic and social environment of the user. The specialist must be able to relate the user's overt business function to all other functions within the company. The trainer must also understand the user's covert objectives and how the user has reconciled them with the company objectives.

Highly successful business executives see themselves as expert users of ideas. They are quite articulate in communicating their superiors' ideas to their workers and ideas to their superiors. They downgrade the importance of information science and equate it with the computer function.

The novice information specialist errs when assuming a business manager will welcome the educational efforts of the specialist. This attitude prevails, even if the specialist is currently producing information and not volumes of data for the user. The business manager is not impressed by the specialist's work of producing information from data or by the process required to collect, catalogue, sort, classify, compare and transfer the information. The weak specialist finds this reaction to information difficult to accept and flees in panic from the business environment.

The business manager does recognize a need for more and better ideas to keep ahead of competition and make better decisions. In the commercial world the net profit of a company depends on profitable decisions concerning future events. The properly trained business information user will gain greater decision making ability.

The information specialist who is educating an executive must be highly sensitive to the user's logical and emotional reaction to information. Business information will often pass through the logic barrier of the mind, but less frequently pass through the emotional barrier of the heart. An example is the cool reaction to reading a report in the office and the warm reaction to information passed as conversation at a cocktail party.

Executives view the information specialist as a word-and-statistics mechanic and are suspicious and fearful of the information transfer procedure. They downgrade the specialist as being a time waster, meddler, and troublemaker. They downgrade the specialist's reports as being invalid, unbelievable, and useless. And, they downgrade the educational efforts of the specialist-trainer as being ineffective, to prevent an extension of the information network.

The value of an information transfer network cannot accurately be quantified and does not appear as a line on the company profit and loss statement. The values related to cost, benefit, or performance are considered abstractions. Some of the abstract benefits to the business information user are:

1. Increased ability to assess risk
2. Better intelligence to reinforce decisions
3. Increased control of the company operation
4. Better understanding of all company functions.

The creation of information from data threatens the business user's status, pride and security. This is part of the challenge facing the information specialist who educates in the commercial world.

The user trainer must be prepared to cope with the awe-inspiring capability of human logic and emotion to bar the reception of information. The logic and emotion barriers are influenced by perception and culture. The barriers vary in intensity within each person and are formed by prior attitudes, conceptions, fears, and fantasies.

Training another person is a human engineering task and requires inscribing on the user's mind and heart a conditioned response to stimuli. People crave affection, approval, encouragement, praise, understanding, sympathy, response, and forgiveness. These elements become part of the trainer's stimuli. A conditioned response may be intensified by pleasure and reward or pain and punishment.

A trainer must have an appeal that penetrates the human soul and be able to stimulate and excite. There is a constant urge for people to think their own thoughts rather than listen. The three listening levels are:

1. Non hearing
2. Hearing
3. Thinking.

To reach the thinking level the trainer will use repetition, summary, questioning and discussion. All communication will be in the user's business language and the specialist must always adapt information science terminology to that level which is easily understood by the user.

The most effective training of business information users is done in person and not through cool communications like brochures, manuals, films, slides, or recordings. Personal contact allows for warm, sensitive, interactive communication of vocal and sub-vocal speech, eyes, faces, hands, and posture.

A successful trainer must have a deep desire to fulfil other peoples' ambitions.

The information specialist who is training others will have an advantage if they have been a part of line management in a company. The specialist will already have a feeling for the quality of the company information transfer network structure. This will assist the trainer in tailoring instruction to fit individual capabilities.

In a commercial organization, the users are members of the line management and the information specialist are subordinates on the staff. In order to extend an information network the specialist must secure the users' approval. One way is to encourage the executives to participate in developing the specifications of the network. It is also possible to develop data sorting systems that allow the users to assign names to the data and provide reports that are easily analyzed.

The procedural steps used by a good trainer are similar to those used by a good sales person. The sequence is:

1. Gain attention
2. Arouse interest
3. Create desire
4. Satisfy.

The specialist-trainer of executives must be clever in applying methods that penetrate the user's natural barriers to written information and be capable of assisting executives to define and analyze complex business conditions.

A successful business manager is rarely inclined or capable of a detailed analysis of data or the transfering of information created from the data to another manager, a superior, or a worker.

The business information specialist who trains must know the commercial environment and accept that information created from data is not knowledge, wisdom or replacement of decisions and action by an executive.

For bibliographical note see p. 211.

FOR WHAT AND WHY TO TRAIN AND EDUCATE ? *

by
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The necessity of training information users as well as information specialists is emphasized. The number of specialists must be increased and the training should be partially inter-disciplinary. The users must be trained to various levels depending on how the concept of need is defined. The author assumes that men must be prepared to function within society and that users' training must be considered an industry, which, through an optimal combination of production factors, will maximise its contribution to the economic and social developments of the country.

The decision to deal with training of information specialists and with the education of the users of information separately can be justified by practical reasons or by the introduction of a symmetry between these two functions. On the other hand, bringing these two functions together allows us to legitimate one with the other, and above all, one by the other. It is what I shall attempt to do here.

We at UFOD have already had the opportunity of speaking about our experiment and of stating our points of view, for the training of informers, of documentalists and for the concept of the users information need [1-2].

A simple square matrix and connex graph allow us to display the dozen or more relations which bind these four key-words. Here I shall confine myself to stressing the importance of some of the items. Françoise Cestac having dealt with the rhetorical conditions: where? when? how? who? by which means how much?[3], I shall try to discriminate the for what? (object) from the why? (aim).

1. *Is it necessary to give the trainers a special training?*

Judging by the number of remarks and attitudes of those concerned with information in whatever the field: scientific, technical, economic, social etc... without having ever received any initiation, or training on this matter, one is led to ask oneself a certain number of questions.

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* This paper covers both the Conference themes and has been placed in session II merely for editorial reasons.

Apart from the harmonious chorus of those who, claim and demonstrate that it is indispensable to have a solid training in documentation (information science) in order to transmit valid information, one must also hear the counter-melody, and sometimes the dissonances of those — and they are more numerous — who in their different capacities: professionals, consultants, experts (all of them experts!), committee members, senior officials who declare, give advice, assign funds for and legislate on information problems and also seek to solve them.

Must we admit that the perception of the problems linked to the processing of information, the one which possesses « a content of knowledge » is innate? Should one be born a documentalist? Above all should one need to have method, order, memory, perseverance, to be able to exercise the profession of information? For my part, I have never had the possibility of reading a « situation vacant column » (for the training of a specialist of information, as for any other) which stipulates that a company must recruit someone who must be untidy, lazy, forgetful... Several years ago, some leading scientific circles seemed to admit (with or without the support of their psychological services for recruitment) that creativity and corporeal entropy were perfectly compatible. But, except for several American firms which precisely recruited candidates whose characteristics were marginal ones, it must admitted that if among documentation or information circles one meets people who « blow up tests », the latter have not been enlisted purposely.

At different levels of our profession, we find people who have received special training. They are few. Around these persons who are aware that information had an objective existence, gravitate people who have not received any special training and who, very often, do not think it necessary to be introduced to information science techniques. Must we admit that we need to possess qualities extrinsic to information science in order to process it validly, or that we are facing the conditions of a « normal » distribution? For my part, I think that Poisson's Law governs us rather than Gauss's Law. In simple terms, some forty years ago, O. Barenton, pioneer of management science, expressed the same views in his « Propos d'un Confiseur »[4], when he wrote — approximately — that: « One meets the same proportion of stupid people at an institution for higher learning as one does in a sector of urban transport. Of course this is a witticism, nevertheless if the practice of information science can be undertaken by anyone, one must expect any kind of a result. It is at this level that the confusion reaches its maximal point between the: for what? (object) and why?

In documentary circles, there is generally a great interest in meetings for exchange of views. Even if some of them generate information, most of them are « gossips », which means, in more scientific terms, zero-sum games. The saying: « If you have a coin, and I the same coin, and if we exchange it, each of us possesses the same coin. But if you have an idea, I another idea, and if we exchange them, each of us possesses two ideas », needs to be expressed with a slight difference. As a matter of fact, it does not specify that each idea, or the two ideas may be wrong, and only an adequate training allows one to discriminate the variants of such an algebra.

In the case of a common situation, information is not very informative and, above all, has a therapeutical value. One tends always to tell the same things, to drivel on like a thesaurus. This is the case as regards a considerable part of technological literature, it no longer teaches anything to those who know, it teaches much to those who know little, and everything to those who know nothing as yet. The last being more numerous than the others, one must be bound to admit — with the help of the means of communication — that for lack of training, anyone could be led to say anything.

The feed back system: Transmitter - Receiver, which I like to refer to is in point of fact modified, owing to the fact that if one transfers information it is because it needs to be disseminated, that is to say, broadly disseminated. The impact of this information anticipated and called for, will modify its characteristics. The game will not only be played between the transmitter (author, creator) and the receiver (reader, or readers), but will be a three-player game: the author, the disseminator (that is to say the producer in the case of mass communication, and the informer in the case of documentation or information science), and the receiver. One will easily understand that one cannot deal identically with communication processes of Mersenne — like scientific communities, and great groups or societies.

Information is never neutral, and the one who transmits it cannot easily be neutral too. During a recent international conference I was attending[5] D. J. de Solla Price, who is very well known in documentary circles, broke a lance with one of his compatriots, whose views had a few years ago exercised a considerable influence in the field of scientific information, and told him « You have a firm to defend, I have nothing but ideas ».

By professional training, we understand equality of levels and overstepping of knowledge. Concerning the training in information processing, it does not appear to derogate from this double necessity. If the hawking of ideas does not always allow distinguishing right ideas from wrong ones, on the contrary, professional training marked with analysis and reflexion would avoid many miscalculations.

In the field of documentation there are many rumours about a certain number of inaccurate ideas. Most of them are disseminated by those who have « heard of » rather than studied. Among these very often misinterpreted ideas, information appears in the front rank. I already have had the opportunity to talk about this problem[6-7-8], I shall return to it, however.

Informatics constitutes a remarkable display of this alarming proliferation of information; one of the fundamental characteristics of our time. However I must, by the way point out that this fact involves us in the risk of being obliged to accept the legitimacy of the invasion of information in our life, with no possibility of discussion, even when there are some cases where we should resist (this invasion) rather than process (information). To these two divergent attitudes correspond two definite professional categories: librarians and documentalists. There is a confusion between information and informatics in the measure that it is considered that informatics only refers to the processing of information. This also explains the « replastering » of the structures and the mixing of competences, that is to say that a girl with a M.A. capable of filling in a punched-card can cope or that, similarly, a documentalist (information officer) knowing how to catalogue can later be used as a programmer[9].

Marshall Mc Luhan showed that media were more valuable than the messages they supported. Don't fall into the trap again. If information can resort to informatics, informatics does not necessairly open on information. It may be true that in a Ph. D. in Computer Science, one introduces concepts such as « information science » or « computational linguistics », finally, one must know who will « use up the scraps ».

We must agree on the fact — that at the present time, documentary — informatics is nothing but a processing of files, owing to the fact there is still a deliberate confusion between informatics and computers. We are very far from the « UHH » (Untouched by Human Hands). To maintain this confusion, there must be, on the one hand, people who think it necessary to keep this ambiguity, (isn't it an element of marketing?), and on the other hand, people, consenting, ignoring or naive or who may be indifferent to the reason why? (aim) of things, that is to say, the great majority of librarians and documentalists at the bottom of their heart are very pleased to be the taps of information flow, the real « terminals » of computerized systems. Each thinks he is delivered from physical constraints, but finally he is transformed into peripheral equipment and overwhelmed with tasks conceived in the interest of machines with no care for the human being.

Information systems are, above all, logical power amplifiers. It is, however, to be regretted that one contrives to make the devices talk childish languages, under the pretext that these languages are the very essence of the most admirable logic[10], particularly concerning the interaction of Boolean logic and the contribution of linguistics to information processing, it will be possible to refer to an interesting study conducted as well on the level of language as on that of « systems », the language moreover being also considered a « system » [11].

In the same way that it is impossible really to « integrate » the management of a living organization, it is difficult to harmonize a training curriculum. In fact, what we are able to do-day may be useless to-morrow. To teach what to-morrow will use, gives proof of imagination, but at the same time shows a lack of realism. A training curriculum must necessarily be fluid (the need to establish permanent liason between trainers and trainees cannot be too often reiterated), which means that those who elaborate it need to possess a certain creativity; it is an indefinable mixture of useful and non-useful matter. Failing which one sticks to the legitimacy of the transmitted information; that is to say, to the fact that pedagogical action implies pedagogical authority as a social condition of practice. However, reducing the ratio of pedagogical communication to a simple ratio of communication prevents us from understanding the social conditions of its specific symbolic or specific pedagogical efficiency which particularly lies in the dissimulation of the fact that it is not a « simple » ratio of communication. It also means that we are compelled to suppose the existence of an « information need » among the receivers, which in addition would be informed of information able to satisfy it and which would pre-exist its social and pedagogical conditions of production [12].

Problems of information and training are, then, formulated in terms of relations of forces. Failure to take them into consideration, means we run the risk of not solving anything[13].

2. *Must we train the users of information?*

Answering affirmatively at the outset, we risk falling into the trap of « needs ». This question forms the subject of a considerable literature, in most cases not really relating to its subject, unless it is considered from a tautological point of vitw, that is to say, that to each consummation process is automatically added a corresponding need [14]. We have already suggested that quite to the contrary, each consummation, necessarily corresponds to a need; we have made the distinction between needs — necessities and needs — aspirations. We shall recall again that it is difficult to establish an inventory of needs, because one speaks of necessities at a given time, and that to make an inventory of the latter implies the choice of a very restricted portion of time, or that it then calls into question the very existence of the documentation organization.

Inquiring about needs is then to inquire about « here and now », but we must modulate at any time, if not we shall have a vague, even wrong image of what happens elsewhere or at another time.

For this instantaneous determination of necessities, we are not opposed but « up-stream » we would add a preliminary study of the field of representation (or better still of the different levels of this field) which for instance the firm and its environment constitutes.

This way of seeing things would imply that the organization of documentation should only be open to its public when the latter recognises that its own field of representation has be effected. In most cases we are wide of the mark, because we need to prove ourselves, that is to say to justify our necessities by aspirations and moreover, our aspirations by necessities.

The study of the field which would allow us to estimate probable information demands should be done at three levels:

- A specific level, bound to a microorganisation. However, at a specific level, it is not possible to establish relations other than those which already exist;
- A middle level which allows the establishment of relations between different fields;
- An upper level of abstraction which only allows comparison with the fields of the possible (creativity).

To these two steps: awareness of the field and adjustment to the necessities should follow a third step, the reduction of needs-necessities (for neeeds-aspirations), in such a way that one must, above all, lessen their number and importance, by improving the organizational state of the system and « homeostasing » it. As a matter of fact, the most efficient documentation organization is not the one which answers the greatest amount of questions, it is the one which allows asking a minimum of questions (should the theory of effacement intervene here?). The notion of the legitimacy of the demand (or supply) of information here appears: it is capable of telling us that it is a matter of a need or rather a justification, a conduct, even a pretext, an alibi.

Examples of justifications through needs can be easily given in documentation. For instance Cecily Surace points out that if terms were simpler and included in thesauri in their specific meaning, it would not be necessary have recourse to permutations, a way which is used when a thesaurus contains compound or pre-coordinate words. E. Wall already had the opportunity to underline that it was in fact a practice of not very experienced indexers and searchers, or that it was justified solely on account of computers Surace estimated that it was necessary to approach the problem on bases other than those used now or « have we fallen into the old trap of manipulating data and producing additional reports as a gimmick to justify computer costs? ».[15]

Let us give another example of the justification of a practice by means of a need. The fact that we cannot lay hands on original documents which interest us urges us to substitute for them abstracts, their abstracts. As a matter of fact, the documentary mass, its importance, time, and cost of its understanding, determine a Ricardo-Type behaviour. Everyone wants to acquire information in a minimum time, information offering a high probability of relevance, but at the same time he runs the risk of loosing a considerable part of the information contained in documents.

Abstracts that are non-redundant and do not loose information are likely to be badly understood. And those which are well perceived, are precisely those which have been deprived of part of their information. Bulletins of periodicals contents and kwic-indexes are solutions at the limit of this problem.

The necessity of saving time seems to aid the current awareness service at the expense of the reference service. To gain time, the user is led to short-circuit the documentation service. Ultimately one does not know who is informed of what. The spontaneous generation of parallel circuits of information opposes integrated information, that is to say integrated management.

To desire to define the needs of a group (research group or any other one) means to a certain degree denying any evolution of this group. At a global level, all aspirations have the same weight. Necessities are instantaneous, not aspirations. Particularly, fixing « profiles » of scientists (researchers) is in opposition to the trends of modern psychology. It is the contrary of the epigenetic conception. In any organization process, there must subsist a degree of non-organization. We believe in the possibilities of informatics, but we do not forget that it cannot be used without a strict premeditation. Since information processing is itself defined as the process of getting acquainted with concepts through their different representations, considering that the emergence of an idea lies not only in the combination of a great number of probabilities, but also of their coincidences in time [11], we can understand that Micheline Cousture has tried to define documentary structures which carry a signifying and signified information due to the epigenetic processing of a language, the creative aspect of which there is a tendency to neglect.

The term « training » of users of information considered in the programme of the present international conference, seems to have been taken in its most general meaning, that is to say, as the set of processes which educate men and prepare them for their rôle in society. This definition seems valuable to us whatever the political regime or the stage of development are; what differs is the accent put sometimes on the expansion of the individual and sometimes on his integration within a group. Education then distinguishes itself from teaching which consists in transmitting knowledge.

We all know that the best documentalists are really anxious to associate with some of their functions the transmitters (authors, writers) and users (readers, scientists, researchers) of informations. Librarians and documentalists wish that authors could in some way become « good writers for memories », in other words that their production could be stored with the minimum of distortion and loss of information. They would like the authors to feel some urge to make attempts at cataloging and that users formulate desires without ambiguity, without falling necessarily into the self-service formula considered in most case generative of entropy.

Of course, in higher education students discover the usefulness, if not the joys, of bibliography but only when they present their doctoral dissertation: but alongside them high school students compelled to frequent and severe controls of knowledge while they are studying, eliminate any information which is not strictly included in their mimeographed courses, and they already have quite a lot of things to do. As to the self-taught, the guideless, but also without prejudice, they run the risk of neglecting information entirely, or on the contrary of becoming bulimic.

In reality, librarians and documentalists feel the need to explain themselves, to speak about themselves, in order to gain recognition. We understand their reasons, but we gently reproach them, that when putting forward their feelings, when wishing to take their place in a tough society, they are reluctant to call for recognition, in the only language it may understand, that is, money.

This society, hard for those who suffer from it, also may be hard for those who are part of it. In France there are 800,000 executives, a notable fraction of whom no longer possesses the levels of technology and competence required for the development of the country. Then what must we wait for? A probably poor conversion towards informaton techniques, the effect of which ought to be beneficial for everyone.

On the contrary, those who will not choose this path, — and there will be more and more when re-integrated into the society as we hope — for survival reasons, will try to restrain the propagation of information in a considerable way. To be persuaded of this, is it not sufficient to study the behaviour of retired people who have a secondary profession?

Apart from the third age, and we think of those who having undertaken or are undertaking studies which no longer correspond to the present or future situation, are invited to « re-learn » « skills of information». University works in this sense and so do other institutions, but never going to the bottom of the problem, that is, without asking the «for what»? and the «why»? So, are we to take the chance that those concerned with this matter might fail or that information techniques do not progress. Either automatisms will progress, and people will be confined to specific tasks, getting rapidly prosaic, or automatisms will not progress and people will exercise their power, that is to say, will intervene as limiters of progress.

For us, the problem of the training of users is dependent more on morale rather than on technique. It is, above all, a general recognition of the rôles that professionals who range from store keepers to the chairmen and to president-consultants of the greatest companies and states can play in a given society (which is still industrial)[15].

But to have some chance to be listened to, one has to accomplish the long march; one has to speak about costs, efficiency, quality, one has to apply economic analysis to training, considering it an « industry », wihch through an optimal combination of « production factors », must maximise its contribution to the economic and social redevelopment of the nation.[16]

We cannot speak here of the information product-ratio (we discussed the subject-matter elsewhere) but we must repeat that one must make a real value analysis in order to remedy the overly weak transitive character of our society, which is surrounded with division, and the value of whose diplomas, according to the case, we magnify or detract.

When the prefect of a French department offers a prize for an administration position which mainly consists in cutting up pieces of paper in order to stick them — granted in a different way — on other pieces of paper, we do not think that this is really a documentary activity, and we are not well placed to estimate whether it is right to confer the highest marks on those candidates with a M.A. in law.

This example is not unique to our country. In Germany, for instance, someone having studied theology is ascribed hierarchical marks to practice the function of programmer. The ways of God are still unfathomable.

Man has the possibility of being informed, to be trained by school, by mass communication media, but also in making use of a third means which is that of documentation organizations.

Teaching through school is, up to a certain level, obligatory. Teaching through audio-visual means tries to find its way. As to the man-machine dialogue, at the moment it takes upon itself the responsibily for the difficulties inherent in lexical information processing and programmed teaching, that is to say, that it can but use a very poor language.

Once these difficulties are overcome, it will be possible to conceive a memory or rather, memories, the content of which will be permanently modified, without however ceasing to consult them. If we limit ourselves to the cadres of the firm, we will notice that the crucial problem of the dissemination of copies of documents will be solved; with no limitation of amount and or transmission speed. But it is easy to see that centralization of the raw information which gives rise to the possibility of realizing in one place only, a synthesis from the programs elaborated by a limited team of specialists, will deeply modify the interdependence of the hierarchical levels of a firm, and their respective rôles. Undoubtely we may consider that tasks which are linked to information and to the personnel who perform them are of a functional type, but this does not detract from the fact that information cannot and can never be automatic. This prospect should incite us to think again about our « models », and make them more scientific. A survey entitled « A magician in the firm: the documentalist », gives us the impression of wishing to deviate from this way. Of course, we know that behind magic there is always a trick, so, may we ask ourselves whether the people interviewed have not tried the 3-card trick on us once more.

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INFORMATION REVOLUTION OR REVOLUTION FOR INFORMATION

by
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The « information explosion » obliges society to organise the circulation of scientific, technical and economic information (STEI) items in the same way as any other economic activity. This is the industrial revolution of information. STEI is a weapon in the struggle for economic and social advantages. To improve the circulation of STEI items the largest possible consensus among members of companies and societies and their effective share in decision making and social progress must be ensured. This is a political revolution. As STEI is regarded not as a product similar to another but an intrinsic part of the individual's value, new patterns of information exchange are bound to cause worry. A cultural revolution is thus needed to help the development of suitable ideas and behaviour. In training for information work it is essential to stress that the setting up of suitable STEI communication channels calls for profound changes in society and individuals and is thus more-or-less consciously rejected.

Introduction

The following remarks are not based upon systematic studies but merely on rather trivial endeavours in day-to-day information work. As a matter of fact, they are related to the phenomena which take place in the French society but one might possibly find for them a wider field of application.

Information scientists and officers may think that such considerations are outside their usual concerns.

But it seems to us that information problems, and particularly training for information work, have to be dealt with in a much more comprehensive way if one looks at effective results.

The « information explosion » leads to an industrial revolution within the information field.

The changes which occured in industrial society regarding the production of goods and later of services have naturally affected the field of scientific, technical and economic information (STEI) where their effects became increasingly perceptible during the last twenty years.

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* This paper only reflects the author's personal views and does not involve any responsibility by his organization.

The deep transformations which resulted for STEI are usually characterized by:

- wealth and variety of STEI items;
- rapid change of STEI items;
- multiplicity of information sources and users;
- high financial value of the possible applications of STEI items.

Though all the inferences of this « information explosion » have not always been drawn, indeed, far from it, ideas and implementations about information items handling have consequently evolved to some « industrial » patterns. This movement was, as a matter of fact, closely bound up with the development of computers and reprographic devices.

The number of information and documentation centres thus increased, as well as their processing capacities, large documentary systems were set up and the facilities offered to users were diversified.

The importance of STEI regarding either its mass and its value and the means alloted for its processing, though they still are all but sufficient, allow us to speak of an « industrial revolution » of STEI.

As all its characteristic features are the everyday worries of information scientists and officers it is presumably not necessary to insist on them.

This revolution is mostly seen in STEI as well as in other sectors of activity as a purely material phenomenon:

- technological upheavals;
- considerable growth of quantities.

Technical skill and adapted investments are thus supposed to enable us to control it.

For this reason most efforts in studies or implementations are directed toward the inner part of STEI systems as for instance indexing languages, data processing systems, etc...

Even users studies, dealing with the relationship between users and STEI systems, tend only to refer to the structure of these systems, though it has indeed been imposed by material and technical contingencies. Little consideration is given to users' social environment and the problems of values.

In the field of information less than in others one could not believe that meaningful quantitative changes have no qualitative consequence or that science and technique are a good in itself operating in an ethereal world ruled by mathematical logic.

Looking not only at the making of more or less elaborated information items but at the completion of useful work, the effective circulation of information items must keep our attention much more than the tools for their storage and retrieval.

We would like to stress two kinds of social factors, among the numerous ones which have to be taken into account. Though they seem to have a particular importance, we tend not to say too much about them, maybe because they are embarassing.

Information is a weapon in the struggle for economic and social advantages.

Information items can be defined as knowledge on the move. Within a society where change is permanent regarding either technical social or economic factors, they are the main kind to knowledge.

Knowledge determines the ability to act, that is to say, the greater or lesser aptitude to secure security and prosperity for oneself. For each cell of a society, whether it be a large group (a company for instance), a little group or an individual, STEI items are the only determining factor of success as they have no substitute.

Information is thusfar an important weapon, if not the absolute one, in the competition among the cells of society. This fact is probably the first explanation of information retention.

The less winning cards in other domains that an individual or a group holds, the more he has to fight with the STEI items he controls. Those who do not occupy a ruling position could only stand up when keeping mastery over the information items they alone detain and which are essential for their chiefs. Conversely the more information items a leading body holds, the more its power is strengthened.

On the other hand, the greater the consensus is within a group about its values and goals, the less acute the rivalry among its members, the more easy and comprehensive the communication of STEI items. To share information items means to share the power.

A first contradiction must then be pointed out in this respect. In various degrees and forms according to the sector of activity or the society, individuals and groups have conflicting basic opinions and interests, compete with each other and consequently tend to limit the number or mutilate the content of the STEI items they are communicating.

This still occurs when self-sufficiency is no more suited for STEI items than for any other product. The age of Big Numbers is necessarily the one of the division of labour and co-operation.

Man's traditional perception of STEI items induces irrational behaviour in their communication.

Irrational behaviour in STEI items communication (by irrational we mean what runs counter to efficiency of work) cannot be explained as the result of this single dialectical relation between power and information.

The Big Number explosion, which characterizes our age, has given rise to another contradiction, if not crisis, of a far more noticeable importance.

The amount of information items which is needed by each individual to carry out even trivial tasks is such that he increasingly depends on external sources and collective institutions. For the first time in a millenaries-old history, the storing and processing capacity of his brain is no longer sufficient. Such a situation is a totally new and traumatizing one.

In fact knowledge, whether acquired by heredity or experience, is consubstantial to each individual. It contributes to a larger extent, if not exclusively, to his value. The transmission of knowledge is not limited to putting information items into circulation. It implies a full personal commitment of the issuer. This causes it to appear very frequently as an initiation of filiation.

The traditional communication pattern requires some adhesion or intimacy between issuer and receiver of STEI items, and the keeping of a relationship among them, mostly like a dominating-dominated one. It barely is suited to the present mass of STEI items or to modern working conditions. Neither is it preserved when the transmission uses collective channels.

Using specialized collective institutions (information officers, documentation and information centres, etc...) means for users a kind of de-personalization.*

The fact that information will more and more rely upon the social division of work and what we may call « the socialization of memory » (data banks, large literature files, information networks) calls for profound changes into either social ideas and practices.

The three revolutions of information.

The amount of STEI items presently produced and the conditions of their use in modern societies make it necessary that STEI be organized on a rational and economical basis, as other activities are.

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* Non directive users' interviews suggested to us that it may be interesting to compare the description which could be given by two identical samples of a same group of users of the personal qualities and skills of the professional for one sample, of the information man for the other one, in order to verify the hypothesis of a dissociation of personality.

This is the industrial revolution of information for which technical training on new processing and organizing methods is needed.

But, as far as STEI is a modality of power practice, its widening and effectiveness suppose an effort to transform economic and social structures in order to reduce antagonisms and ensure that every one can take a really responsible part in the society.

According to societies, it is a more or less important political revolution.

But if these transformations are to be really worthwhile they have to be accompanied by significant changes in mentalities, in the image and practice of the tri-nomial « man-knowledge-environment ».

This is a cultural revolution.

As regards the last two features we do not think that many results are likely to occur within the coming years, or centuries.

But we do indeed believe that no undertaking and no training for STEI is worthwhile unless it has taken into account the above-mentioned contradictions and at least tried to tackle them through the various possible approaches, within the very small margin between old-established habits and change acceptance.

Information scientists and officers must however be conscious of the fact that their discipline is a corrosive one for the established order. The rather poor status where they often are confined may result, all things considered, from an unconscious defensive reflex.

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THE TRAINING OF USERS OF THE FRENCH SCIENTIFIC AND TECHNICAL INFORMATION CENTRES

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The reasons for the need to train the users of scientific and technical information centres are discussed, and in connection with the courses described in the paper, an explanation is given of the way in which the convincing of senior executives of the importance of information systems, the initiation of young technicians, scientists and researchers in the use of information and the teacher supply and training problems are conceived.

The authors has written this paper in three capacities:

- as Director of a multi-branch French Information Centre responsible for forecasting and meeting the requirements for professional information of a group of civilian or military Departments, Establishments and Companies employing a total of over 200,000 people;
- as the organizer of a working group, consisting of the Association Nationale de la Recherche Technique (National Association for Technical Research), to organize firstly the training in information work of the technicians using our technical information organizations and secondly the conversion of engineers or research scientists wishing to guide their career towards information work;
- and also as editor and promoter of a programme intended for young executives, whether engineers or research scientists, who are not yet experienced in the art of information.

I intend to show you in the form of evidence:

- why we were led to promote this action in favour of present or prospective user executives of scientific and technical information organizations;
- how we planned and achieved this action;
- under which conditions its success can be guaranteed.

I. *Why did a training Programme seem to be necessary?*

Daily observation of the attitudes of engineers or executives with regard to the large information centres led us to note the following passive features:

- These Centres are little used by the executives themselves. One mainly finds company information officers there.
- few executives consult indexes, files and library records themselves. Only a small number ask to be sent personalized descriptite information. Document or document photo-copy orders are always made on behalf of the same users.
- Our contacts in workshops, laboratories and drawing offices show that information requirements are scarcely felt and nearly always badly expressed.

These attitudes, evidently harmful for companies which may thus, in vain, repeat research or produce equipment unsuited and products wrongly designed with regard to competition, are even more so for the whole country, both with regard to its economy and to its National Defence.

The reasons for this attitude seem to be due to the following facts:

- Secondary schools and universities do not teach their students how to develop or keep their knowledge up-to-date by organizing their own information.
- Information languages are esoteric for users; information circuits are unknown to them or seem to them to be unattractive.
- Information products are too copious, redundant, whilst containing serious omissions.

This diagnosis led us to think that we should take action at once with regard to our executives, engineers or research scientists, firstly, to teach those beginning their career in industry how they can be best informed and how they should inform others; and secondly, to prepare a few more senior executives who agree to promote our information programme in their department.

For the senior executives, this entailed a consultant activity lasting a few hours monthly for the benefit of their colleagues and also for the benefit of professional information officers whose efficiency needed to be increased.

II. *How we planned the first training programme mainly intended for Junior executives, engineers or research scientists.*

Taking into account the above-mentioned observations, we felt that we should make those concerned assimilate a number of practical procedures. The objective is to train them to:

- identify their present or future work difficulties, or further to define the required improvements, because these preliminary steps are necessary to locate their information requirements;

- express the nature, volume and level of these requirements and their purpose;
- state the sources of information most appropriate to their problems: address directories, descriptive documents, collections, publishers, various organizations;
- to organize their personal information (selection and annotation of reading material, contacts to be maintained, document indexing, filing and query information access);
- to improve the diffusion of their thoughts or of those of others by a clearer presentation of reports or surveys, by a more methodical preparation of seminars or papers, by a constant contribution to information work.

With the objective of providing for those concerned a method and not a mere intellectual polish, I designed this course programme, based on the experience I gained from those I taught and from what I had prepared nearly twenty years ago for the practical further training of Executives (coming from the TWI). It is given to groups of eight to ten trainee executives or supervisors.

The rôle of the organizer of these groups is to make the participants discover a methodology by presenting typical cases, and then to have this methodology applied by the trainees to cases taken from their current work, urging them to correct their methodological errors on their own, until they have completely acquired the necessary « savoir-faire » or know-how.

This programme consists of six group sessions lasting about two hours, spread out over three weeks, and, of two consultant-interviews between each trainee and the organizer who comes to visit them for one hour between the session. It also implies following up the training supervised by the trainee's superiors in the months following the course.

Illustrations, manuals and printed documents are used as teaching media so as to better implant the recommended procedures in the trainees' memory. The instruction can be given in a meeting room of any Company or even outside the Company and preferably, in a pleasant environment lending itself to reflection and thought.

A manual serving as a guide for the instructor has been fully drawn up under my supervision after consultation with over twenty-five specialists of the ANRT (Research) and of the ADES (Librarians) after examining the most recent documents dealing with these matters.

This manual is timed. It mentions, stage by stage, the moment to use each teaching medium, the exercises which have to be done, the documents to be presented and any visits that should be organized.

Experiments carried out in various companies have enabled us to perfect this manual. Revision will be continued in the future so as to make future trainess benefit from the experience accumulated by all of the instructors.

In a similar manner, and under my leadership, the ANRT working group has planned the second programme intended for the users, also future co-operator advisers. This programme, which is designed to be taught in ten three-hour sessions, was prepared by Mesdames Bunodiere and David.

The first programme, for junior executives, obviously has a large potential clientele. In France, for instance, it should theoretically be taught every year to the 20,000 executives passing from our universities to industry, while the second programme for co-operator advisers, should concern about a twentieth of this number, in other words, for France, about one thousand qualified executives.

III. *Conditions of application and effects expected.*

It goes without saying that in order to teach, you need instructors. If we decide, for instance, to train 10,000 executives annually, we must organize ourselves to plan one thousand annual sessions of ten executives. A score of full-time professional instructors could fulfil this task but we feel that it would be preferable not to use such an exclusive scheme.

As it is preferable to have instructors with a good knowledge of the environment, the habits, and even the requirements of their future trainees, I feel that it would be better to look for a major part of our future instructors among the executives of the professional circle concerned, asking them to provide this instruction only on a part-time basis. We could thus look for our instructors:

- either among organizers of other executive training courses who would agree to teach the art of information with the help, if required, of the company's information staff, as demonstrated by the French Coal Board Scheme;
- or among technically trained information scientists who would agree occasionally, to be the instructors of their prospective customers as demonstrated by the Institut Corps Gras;
- or else among users who are already co-operators who would agree to associate with their activities as advisers the task of training the collaborators it will be their duty to advise.

There are thus many possible schemes. The main thing will always be to find a man or a team combining sufficient teaching skill (so as to teach and conduct a meeting), sufficient documentary know-how and scientific and technical knowledge approximating the knowledge of the trainees.

Once the instructors have been appointed, they also have to be trained. This is the duty of the senior instructors. I am provisionally assuming this capacity in addition to my usual duties. The prospective qualified instructors are trained in two one-week sessions. Once trained, the instructors should plan their instruction sessions, publicize them and get volunteer and firmly decided trainers, and (here is the point) this is where another need arises: the need to convince senior executives.

For them, I have prepared a booklet entitled « Self information for low-cost innovation ». Company Directors and « Deciders » will find in it, in dialogue form, a demonstration of the enrichment that a well-adapted information system can provide for their company and for themselves. They will also find therein practical suggestions for better information and for organizing, on a company or professional level, an information system. Finally, they will find in it a reproduction of the instructor's manual.

I hope this booklet will soon be translated into all the european languages.

I should like to mention too the action taken in France by the CNIPE to promote further the self-information concept.

For the general audience, I have a film produced by my Documentation Centre entitled « The three ages of documentation ».*

It is perhaps too soon yet to mention the effects of this training programme. Its planning however has already enabled information officers and engineers with different outlooks to come closer to each other, to perfect their methods and to convince each other even more of the vast possibilities of a well adapted information system.

When all executives know how to be informed, companies will know their prospective markets better; they will innovate more usefully and less expensively; the standard of living of their employees will rise and the social atmosphere will improve... This is not a dream: it is an objective which we must ourselves attain by informing company directors, by agreeing, temporarily, to be organizers by methodically educating company executives, university students and members of large associations.

It is up to each of us to take the necessary action.

* Copies of this can be made.

ING. GÉN. IVAN RENAUD (France) the former Director of the Centre d'Essais en vol D'istres has been Director of the Centre de Documentation Français de l'Armement since 1967. Since in the course of his career he has been responsible for the training of the personnel of a large technical organism, he is still particularly interested in the problems of applied training and specialization particularly for documentalists and the current and future users of documentation. At the request of the Association Nationale de la Recherche Technique and an Association de Bibliothécaires he set up a Group responsible for working out the correspondent training programmes. He is a member of the Comité National de la Documentation Scientifique et Technique and takes an active part in the creation of French documentary resources. He is the author of several publications and a film entitled « *Les trois âges de la documentation* ».

THE ORGANIZATION OF TRAINING AND CURRICULUM FOR STUDENTS AS FUTURE USERS OF INFORMATION

by
IVAN WIESENBERGER,
Department of Information Science,
Charles University,
Prague

This paper presents the organization and methods for training students as future users of information. It considers students of universities and other institutions of higher learning. The aim of this training is discussed and the notion of their information standard is explained. Different forms of this information training are outlined. The problem of producing the right teachers and textbooks for this training is considered. Some experience with the various training programmes is mentioned. A curriculum for this information training with proposed division of special courses and excursions is included.

In the category of future users of information we can discern pupils and students. This paper will discuss only the organization and methods of training students as the future users of information. It concerns students of universities and other institutions of higher learning (students in natural and technological sciences, social sciences and humanities).

1. *Introduction*

The information training of different categories of students should strive to increase first of all their information standard. The information standard of these students corresponds to their knowledge of and ability to acquire, accept, understand, transform and disseminate information to which they have a potential access and which they should use in their activity.

Thus they should be familiar with the institutions where the necessary information sources can be found and know from what information sources the relevant information can be drawn and how it can be put to a practical use. Furthermore they should know how to produce new information and understand the way it is disseminated to further users. At the same time they should have at least some knowledge of psychological aspects and scientific methods connected with information and other intellectual activities. Last but not least they should be acquainted with the general tasks of information work and information science and recognize the importance of their co-operation with information workers.

Taking into consideration the knowledge and capabilities that the students should obtain during their information training, the conclusion is reached that their whole programme of information education should be composed of the following three parts or levels:

1. Technology or methodolgy of the use of the information institutions (how to use the information institutions and what kinds of institutions).
2. Technology or methodology of their own information work (how to acquire, transform and disseminate information by the students as future users).
3. Technology or methodolgy of the intellectual work connected with its fundamental psychological aspects and scientific methods.

II. *Forms and time implementation of information training*

The first problem arising from this three-part information training programme is by what sort of forms and kind of time division should this be carried out. The above mentioned teaching programme could be taught using some of these four approaches:

1. by the introduction of information science into the general curriculum for the duration of about thirty hours (this form is proposed by FID/ET Committee);
2. by means of special short courses with a duration of only several hours (for example five times, for two hours);
3. by means of an internal intensified course with a duration of several days (for example three or four days);
4. by integration of information science into some of the other subjects (division and implementation of its content into either two or three different courses).

All four forms of teaching information science (lecturing on information work) should naturally be completed by several practical exercises (seminars) and by excursions to some of the information institutions. Apart from lectures, exercises and excursions, some films about information work may also be used for teaching and it is also recommended that some short practice in various, namely special information institutions, be arranged for students. Through this experience the students should also learn to make their own (personal) documentation.

The content of information science (information work) could be taught by being implemented variously into the general curriculum. All three above-mentioned information methodologies could either be taught together as a special subjects as for example, « fundamentals of information science », « introduction to information science », « methodology information », etc. or separately in combination with other subjects. The FID/ET Committee recommends that the information material should not be divided but be taught as one subject which could be placed in the first or second year of study.

III. *Teachers and textbooks for information training.*

The second problem of the organization of training for students as information users is — by what sort of lecturers/teachers and with what kind of textbooks the proposed teaching programme should be carried out.

The following could be considered as possible lecturers/teachers for information training.

1. Highly experienced and qualified librarians from university, scientific or special libraries (for the first part of information methodology).
2. Information specialists either from central information institutions or special information centres (for the second part of information methodology).
3. Teachers/lecturers from either information or library departments (chairs) of universities (for all three parts of information methodology).
4. Teachers/lecturers from other special departments (chairs) of universities (for the second and third part of information methodology).

It is naturally supposed that all the above-considered teachers who should lecture on any part of information methodolgy to students as the information users, must know their topic of information methodology and must have some pedagogical approach to the students as the information users.

Because of the lack of teachers with this knowledge and with those capabilities it would be necessary to organize special training for them (a special course for teachers who intend to train information users).

The question of which kind of text-book should be used as material for the teaching of information methodology (for users of information) is rather complicated. The same book or text which is used for teaching either librarians or information workers, or scientists is not acceptable. A special book or text which is either already or would be specially written for information users must be employed. Because of the fact that such kinds of books/texts, with a few exceptions, do not exist, it would be necessary to prepare them. Their content should either be combined (all three methodologies together) or specialized (a special text for each methodology). The combined methodology could be written by some teacher from the department (Chair) of information science of some university, the first divided methodolgy by some special librarian, the second by some information specialist and the third one by some special teacher from a university. The FID/ET Committee recommends that special text-books for the users of information, which should be worked out by the FID/ET working group for users, be prepared.

IV. *Curriculum for information training.*

Considering the proper organization of information training for students in different universities and other institutes of higher learning, it seems most useful to implement information science in their general curriculum as one subject (course) called either « fundamentals of information science » or « methodology of using scientific information ». This subject should be taught either in the first or second year of the general curriculum according to the scope of the whole study programme at the university concerned.

According to the above-mentioned conception, the whole methodology of information science necessary for the students of different universities as users of information, is divided into three main parts which are taught during one semester as one subject (course). The two-hour weekly courses should include lectures, exercises, excursions and other activities connected with information training of users. The proposed division of special courses (lectures) and excursions concerning methodologies of information science, needed for students as users of information, includes the following survey:

1.	*Aim of the information training for students as users of information* (importance and rôle of information training for students as future users of information)	two hours
2.	*Information science as a newly developed discipline* (notion, content, importance and task of a newly developed inter-disciplinary science)	two hours

3.	*Scientific information and its rôle in modern life* (origin, structure, communication, aim and task of scientific information in various human activities)	two hours
4.	*Sources of information and their value for users of information* (generation, categories and possible utilization of information sources, holdings and files for different users of information)	four hours
5.	*Information systems as effective means for communication of information* (notion, structure, surrounding categories and functions of information systems and sub-systems)	four hours
6.	*Information institutions as organization for information service* (main categories and general organization of information institutions with their different services for information users)	four hours
7.	*Information workers and users of information* (function of information workers and users of information and their mutual co-operation)	two hours
8.	*Methods of acquisition of needed information* (catalogues, files, reference, journals, bibliographies and other means which help the users of information to find the relevant information)	two hours
9.	*Mechanization and automation of information work* (main features of mechanization and automation of information work and its output applied by the users of information)	four hours

10. *Psychological aspects and scientific methods of intellectual work* (psychological and scientific methods applied by users of information to their acquisition, transformation and utilization of information and to management, research and other creative work.	four hours
	thirty hours

Dr. Ivan Wiesenberger (Czecoslovakia) has been active in information science since 1945. His practical activity included foreign trade, (information for marketing), heavy industry (information for machinery and for atomic energy) and the State Technological Library. Since 1965 he has been Senior Lecturer of information and since 1970 also a research worker in informatics at the Department of Information Science, Charles University, Prague. Before and during his professional activities he has studied law, economics and certain aspects of technology and philosophy taking a law degree (ML) and a scientific degree in Philosophy (PHD).

CONCLUSIONS OF THE INTERNATIONAL CONFERENCE ON TRAINING FOR INFORMATION WORK

1. That, appreciating in particular UNESCO's efforts in establishing the UNISIST programme, the attention of governments should be urgently drawn to the importance of documentation and information activities for their own work, and to their responsibilities for encouraging and providing the necessary resources for the organization and development of training in information work.

2. That in every country the special needs for trained personnel in all the different sectors (libraries, documentation centres, data banks with or without use of computers) be made the object of current and constantly updated study and evaluation.

3. That research and development studies on information processes and systems should be carried out in close contact with teaching and research institutions. In particular, institutions of higher learning, especially universities, should be encouraged to establish such efforts as rapidly as possible.

4. That basic training in methods, techniques and functions of information work be given in common to all branches of the profession, wherever this is possible, and that specialized training be based on that common ground.

5. That basic teaching of the use of information sources and media, and of information transfer processes, be introduced into the school curricula at the earliest possible stage; and that, to make this possible, facilities should be provided for school teachers to follow theoretical and practical courses on information science and technology at institutions of higher learning.

6. That no graduate leaves a university or college without the knowledge enabling him to get access to, and make use of, the information sources necessary for his scientific or professional work.

7. That authors be made aware of their double function as producers and users of information, and of their responsibility to facilitate the

use of information from the moment it originates and to participate actively at the various stages of information transfer, including problems arising from the needs of information processing machines.

8. That there should be undertaken psychological and sociological studies related to a) processes of requesting, selecting and assimilating new information by users; and b) current pedagogical research on the processes of intelligently transferring knowledge by teachers.

9. That, to overcome the situation that library and documentation (information science) schools, run by different organizations and in different countries, issue certificates and diplomas which are similar in wording but reflect different levels of professional knowledge, the competent international and national organizations should understand their responsibility to evaluate the different certificates and diplomas and issue a concordance which should clearly show their corresponding levels.

10. That, in agreement with the relevant recommendations of the UNISIST Conference Report, stressing the need to ascertain user requirements before embarking on extensive programmes to stimulate the development of new kinds of information services, UNESCO be asked to encourage, via contracts, appropriate studies by the professional organizations.

11. That, in agreement with the UNISIST Conference Report, existing programmes for training the users of information as well as information specialists and information scientists should be encouraged and made mutually known, by means of clearing houses for the exchange of information concerning these programmes.

12. That, in all these programmes, in order to comply with the multilingual character of publication, the teaching of living foreign languages should be included.

13. That regular refresher courses for documentalists of all levels be recognized as a necessity equally urgent as the training of new personnel, and be carried through in parallel with initial training. These courses are indispensable, because of the rapid development of methods, techniques, systems and services, and should be open to all those already trained as well as to those exercising functions in the information field without having been trained previously.

14. That special attention be given to the development by competent organizations of concentrated training courses for those who, although

not practising documentalists, are nevertheless responsible for information centres or services; this would include administrators, government councillors, executive directors, senior managerial staff and the like.

15. That due attention be given in training courses to two aspects of management: *a*) information as an integral part of management, including training for management; and *b*) management techniques as an integral part of courses in information science and technology.

16. That programmes for the training of information workers should be oriented towards the future, taking into account the rapid development of documentation techniques and the changing needs of users.

17. That courses be established for the training of qualified persons to become teachers for courses in information work, especially in developing countries; and, in addition that all possible support be solicited for the creation of the international institution for advanced training of teachers of information work, in particular for meeting the needs of developing countries, as envisaged in the programme of FID.

18. That all organizations in this field, national, regional and international, should establish close contacts with each other in the early stages of planning their projects, and that appropriate mechanisms be established for this purpose, and also for authoritative representation in international programmes.

19. That all existing and projected efforts in the field of standardizing terminology of information and documentation on an international level should be made public as quickly as possible. The different efforts should be co-ordinated and directed towards the establishment of an internationally agreed, standardized terminology in the field of information work, in close co-operation with ISO.

20. That information on all approved standards in the field be made widely available, and educators encouraged to use such standards as teaching aids.

CLOSING ADDRESS

by
The Hon. MARIO ZAGARI,
Minister of Foreign Trade and Chairman of the Istituto Nazionale dell'Informazione-INI

Ladies and Gentlemen,

We have reached the end of our conference and the time has come to take stock of its achievements. I think that we can all agree that the occasion has produced some really worthwhile discussion which has, indeed, at times provoked some really lively exchanges. Experts in the various sectors have sought to identify the nucleus of the complex problems we have considered here, We are, of course, all in a certain sense the producers and users of information and consequently concerned in the debate. But it is, above all, the specialist who has been affected by the growing multiplication of the sources of information and it is the informatics technologist who must be capable of providing the effective support that the former needs and has the right to expect.

Thus in these last few very full days we have witnessed a discussion that has run on two parallel lines. On the one hand, the traditional documentalists and librarians have acknowledged the need to extend their activities to techniques that are new to them, on the other, speakers on all sides have recognized that the development of information and its techniques imposes to a dramatic degree the problem of manpower.

Documentalists have had to accept the fact that in recent years the rapid development of science and technology has called for new ways of classification, processing, retrieval and dissemination of information and that what has been achieved so far is inadequate. They have discussed creatively and pragmatically the ways and means to tackle this situation.

In general, all those concerned in information science, practitioners and users, have come to realize that without manpower we are in danger of finding ourselves with pilotless machines and that the skills required from system designing to programming and the operating of computers take time to acquire and perfect. In effect, the often expressed fear that machines could be developed of such a degree of self government as to invade man's traditional sphere of interest is now being discounted. Here we find ourselves facing a typical problem of our times. The rapid advances of a technological society mean that the rising generations must learnt to live with and dominate the machines and hence they must be provided in good time with the store of knowledge and the experience they will need to do so.

Both at their simplest and at their most complex, machines are the product of creative intellects and need to be manned by persons of expertise and ability if they are to used effectively and to full capacity. As things are at present, it is no exaggeration to say that we have the machines, we recognize that they are capable of virtually unlimited development and of adaptation to a vast array of different applications, but we lack the manpower. The most damaging effect of this situation is the immediate negative repercussions it has on the productive processes, and the resultant danger that humanity will not reap the potential benefit it should for its advanced technology, thus seriously retarding economic growth.

Humanity therefore faces a profound dilemma; on the one hand it rightly has expectations from the expansion strategies its skill has made possible, on the other, no increase in the national income will occur unless there is more widespread and appropriate use of the available means.

Education and training, then, are of paramount importance, and for this Governments must shoulder the main responsibility. Professor Arntz made a sound point when he observed that a modern democracy has a duty to its citizens of providing a constant and controlled flow of information. Failure to do this or doing it badly must lead to the very real danger of depriving a people of their spirit of initiative.

It is hardly necessary to emphasize how great is the harm that can be done to a community which suffers from the monstrous manipulation of information which occurs in a dictatorial regime. It is for the public authority to educate and to do it in a responsible, objective way.

An interesting example comes from the United Kingdom where some five years ago the Government entrusted the National Computing Society among other bodies, with the promotion of training manpower. The Centre now has a staff of 200 and has functioned most effectively. More than a thousand persons at managerial level in industry and administration have been given computer appreciation courses. A national certificate in systems analysis in co-operaton with the British Computing Society has so far been awarded to some 1700 students — an impressive figure in so short a time. And among other developments instruction in the new electronic techniques has, to date, been introduced in 165 secondary schools.

In my opening speech I referred to an equally effective French initiative and this brings me clearly to the answer to the question posed above. Only a public organism can be entrusted with such responsibility. It is for the state, above all, to ensure the training of the necessary specialists in information science in time and in sufficient numbers and embark at once on the necessary studies for assessing the manpower on a short and medium term basis and, as far as possible, a long term one as well. We well know that where a science policy has made possible the attainment of sound results, it has been the political will that provided the motive force. Appreciating that science and technology could serve to achieve certain ambitious objectives, the resources, the men and the programmes needed to attain them were procured. The same must occur in the case of information. The control of the sources of information its storage and dissemination can become a reality only if there is precise political commitment in this respect. The technology of information must have its place in a country's planning.

Another element has clearly emerged during these days. Information, by its very nature has an international dimension. The drama of our times — the tragedy — is the splintering of the world into rich and poor areas. The former tend to increase their richness and to become integrated in large homogenous power blocks, the others, inspite of development aid and insipient industrialization, are tending to become poorer and are facing extreme difficulties in containing and reversing this process. Too many things are lacking to enable them successfully to follow in the track of those that head the race. Information is an important factor in this situation. I personally fully support the recommendation contained in the UNISIST Programme, according to which international information systems must be developed to the maximum and that attention shoud be given to the desirability and feasibility of internationally-oriented training and educational assistance programmes, which should involve the pooling of resources and the setting up of regional educational institutions. The developing countries are already aware of their information problems, their need for national and regional systems and training schemes. As a paper from a FAO expert reveals, in the Third World at least a million documents are in danger of being badly used or entirely ignored for lack of a dissemination system. Governments in the industrial countries then have responsibility not only for information dissemination and training in their own countries but also for aiding the emergent countries to tackle their even greater difficulties.

Finally I should like to return, briefly, to the Italian situation; indeed I feel bound to do so as a result of what has been said during this meeting by all the Italian speakers. So far it is claimed that the answers that have been given in our country to this complex of problems have almost all been negative or at best half-hearted. It must be conceded that this view is substantially correct. The public administration has, in fact, failed to take a lead and we have gone ahead as best we can in an unplanned, chaotic way and, as long as the state fails to shoulder its responsibilities we cannot hope for an improvement.

The state must be prepared to take some reasonable risks — the country cannot afford to lag behind the other industrial countries which already have informatics and information policies, many at an advanced stage.

The lesson we can draw from this is instructive; when society is compelled to adapt to new innovating processes the state has a decisive rôle to play. Responsibility lies with the politicians, the men of government, the public administrators for the evaluation of the advantages that can arise from innovation and for the elaboration of the necessary policies and programmes, for the funding needed and the establishment of the requisite institutions. Today we are witnessing a general upheaval in development strategies. Countries and regions which up to a short time ago played a small part in such processes are now very much on the scene and the situation is extremely fluid. The world, even if not in an entirely linear way, is tending to enlarge its markets and integrate its cultures and technologies, to expand its productive activities and draw into the expansion circuit an ever increasing number of countries.

Therefore responsibility for long-term planning cannot be evaded. The time is more than ripe for the coordination of the pressent unplanned, sporadic initiatives in a coherent information and informatics policy.

In my opinion a public body for informatics should be created and should without delay investigate the decisions that ought to be taken, to press for and guide their implementation. Such an organization should be provided with a sufficient degree of autonomy although working in immediate contact with the government authorities. We feel the need, as do other countries, for a really active agency with a limited but highly expert staff guaranteed the possibility of taking effective action.

It is true — as our own speakers have said — that it is no longer possible to ignore the insistent requests coming from below. The goodwill efforts that we in INI also have promoted in an attempt to rouse the attention of the public authorities are no longer of much use — and it is certainly not a matter of producing a few vague pages in a national planning document.

We have reached the moment of decision. Either we must at once begin to plan and co-ordinate or allow things to go an developing as at present with all the attendant disadvantages. Naturally I see no alternative to the former. I am convinced, and I am not alone in this, that the longer such an answer is postponed the greater the price the country will have to pay.

Ladies and Gentlemen, in the name of INI, I must thank you all most warmly for the valuable contribution you have made in focussing attention on the problems of the training of informaton workers and users and the opportunity that you have thus given to restate authoritatively to Italy the problems of information. I am certain, looking beyond our purely domestic problem, that the conference has provided an excellent vehicle for a reciprocal knowledge of each other's difficulties, policies and needs and for a worthwhile exchange of views.

I particularly wish to express my deep appreciate to the FID for its inestimable help in bringing to Italy experts from all parts of the world, and to offer my thanks to all of you that have taken part in this conference for the contribution you have made of your expertise and experience. I sincerely hope that you will feel that our meeting has served for an indepth study of the themes we have tackled and that their results will give rise to further fruitful activity. My very best wishes and those of my collaborators in INI go to all of you.

Lastly I should like to thank the Italo-Latin American Institute which by giving its hospitality to our conference, has once again shown its awareness of the problems of modern society from which, most certainly, the developing countries cannot be excluded.

CLOSING ADDRESS

by
Prof. Dr. H. ARNTZ,
Vice President of the International Federation for Documentation - F.I.D.
The Hague

Ladies and Gentlemen,

I say that the documentation situation in Italy during past years has very often been a concern for us in the FID and, I know, in other international organizations too.

That this state of affairs has notably improved in recent times is certainly due to the creation and the activity of the National Information Institute and, I should say, also to a new interest on the part of the Italian Government for the problems of information and documentation.

When we worked on the Organizing Committee for this Conference we could see that under the Chairmanship of Minister Zagari and the strong guidance of Dr Firrao this Institute for Information succeeded in establishing contacts and liason everywhere, entering into the heart of international documentation problems and services and gaining a wide knowledge of documentation in the world, thus finally giving Italy a wide place in these international efforts.

I must say that it was the greatest pleasure to work with you Dr Firrao, who really became our friend and with all of your colleagues and with you, Professor Caracciolo with your constant readiness throughout the organization of and during the Conference to help towards its success.

I know that neither you Dr Firrao, nor your collaborator, Mrs Lubbock — English by birth, Italian by adoption — slept for many nights. A special word must go to the latter for the editing of the wonderful volumes of the Documents in Italian and in English, an admirable feat of editing, printing and translation, all done in the space of two or three weeks and in our hands well before the opening. This was marvellous work. Thank you very much Mrs Lubbock and your nice daughter sitting there who was always at our side with her ready help during the days of the conference.

I must confess that we were, in fact, afraid that there might not be sufficient interest in Italy and elsewhere to bring such a conference together here, but we have all seen that, on the contrary, there is very much interest for these important problems and that delegates from all parts of the world have undertaken long journeys to discuss these vital questions during three days of intense work.

But the discussions would not have possible if the ladies and gentlemen behind you, the simultaneous interpreters had not done such an excellent job and been willing to work on so cheefully beyond their normal hours - tonight, at his late hour, they are still with us. I ask you then to thank especially our simultaneous interpreters.

Ladies and Gentlemen, we must not forget that we have a marvellous meeting and I want to thank you once more, Dr. Firrao, for having made this highly useful event possible and the Italo Latin American Institute for its generous hospitality.

I think that we are all agreed that we have done some hard but good work. The proof of the commitment of the participants and the profound interest shown for the problems under discussion lies in the fact that we have sat here, in this hall hour upon hour, day after day, at work, and that so many of us are still here so late this evening, after voting with conviction and a sense of common interest the final conclusions.

I think that one of the factors that ensured the success of our conference from the outset was the warm welcome we received and the care with which we have been looked after; this gave us at once the feeling that we were in a very friendly atmosphere and has created the ideal climate for our work and our discussion.

All of us have experienced here not only a great interest in the problems of documentation, but also profound reciprocal understanding.

CLOSING ADDRESS

by
Dr. RUGGIERO FIRRAO,
Vice Chairman, Istituto Nazionale dell'Informazione - INI,
Rome

I shall only say a few informal words because, I must confess, I am very tired.

This conference has been for us an important effort, since it has enabled us to act as hosts, here in Rome, to a large number of persons, specialists in the fields covered by our meeting, who in coming here have shown great confidence in us. Confidence, because our Institute is still very young since it was founded two years ago through the efforts and enthusiasm of a group of private persons who had recognized the importance and the urgency of the problems of information — private persons of the most varied professional and cultural extraction, united in the belief that the time was more than ripe for action in our country.

From the outset, we felt that our Institute could make a most useful contribution in bringing together for discussion as wide an international group of experts as possible in an attempt to advance the effective development of information and documentation, which have had and will continue to have such influence on the industrial and scientific sectors. In other words, to help the achievement of more effective results in the world of productivity.

The conference has, indeed, been for us a motive of great satisfaction since we have seen here in this hall, persons who have come from far and wide, discussing in a spirit of fruitful collaboration the problems, the theory and the ideas of training in information work and agreeing, after searching and lively discussion, a series of conclusions that we consider to be of the utmost importance.

Their importance is, perhaps, more political than technical since they are mainly aimed at shaking governments out of that state of topor into which they are apt to fall when confronted by problems of this type.

Especially in our country, as you will have heard not only from the Hon Mario Zagari but from all our other national speakers at the conference, there is as yet virtually no real awareness of these problems and our Institute works daily to make a contribution, even if small, since our means are small, to try and overcome this situation.

I should like to close this meeting by extending our heartfelt thanks to you all. In a particular way I want to express my gratitude to the FID because it has given us faith in ourselves, more indeed that we realized that we had, when they entrusted us with the task of organizing this Conference.

My thanks go to Professor Arntz who has not only been a valued collaborator but a most sincere friend, and to Dr Sviridov who sadly was unable to be with us on this occasion, but who was one of the first to give us this trust. I recall him with affection and gratitude.

I also want to thank Mr Piròg and Dr Foskett, for acting so efficiently as general rapporteur and for the contribution of his great culture. Lastly my thanks must go to Professor Caracciolo who has been at our side at all the most important moments of the organization of this conference.

Finally I want to thank all of you who have given us your friendly support and take leave of you in the hope that we shall have another happy occasion for meeting together again in the not too distant future.

THE CONFERENCE - SUMMARY OF THE WORK

The Conference was opened on Monday morning, 15th October, by the Hon. *Mario Zagari,* Minister of Foreign Trade and Chairman of the Italian National Information Institute with an Address which is printed in full at the beginning of the volume. He ended by reading a greetings telegram to the delegates from the President of the Italian Republic, the Hon. *Giuseppe Saragat.*

In his welcome, Ambassador *Carlo Perrone Capano,* Secretary of the Italo-Latino American Institute which had kindly lent its premises to the conference and given hospitality to some of the South American participants, said that today, technological progress was being made at an overwhelming rate and, in the communications field alone, innovations were making their appearance that were capable of overturning all the traditional means of information communication. But this progress, be it remembered, has hidden, ususpected dangers and certainly informatics, if not well understood, could easily transform itself into a system capable of destroying the very progress that it ought to guarantee. Hence it was a matter for satisfaction that experts from all five continents, including a strong contingent from South America, had come here to consider and find practical solutions for some of the vital issues underpinning the gigantic work of the selection and storage of knowledge in full respect for human liberties. This could only be assured if, in all the information sectors, men endowed with the necessary qualifications and formation are available to control the machines that human genius has created.

The Chairman of the opening session, Prof. *Caracciolo di Forino* then spoke on behalf of the Hon. *Camillo Ripamonti,* Minister of Scientific and Technical Research, absent from Italy on an official mission, in which he emphasized that the theme of information had today become fundamental. It was no longer mainly the preserve of a narrow circle of scientists and technicians but was now, from many aspects, also the vital concern of politicians and men of government. Recognition of the value of information was leading to a change in research itself. Information was beginning to be seen as one of the basic requirements of humanity as was so opportunely recognized by the UNISIST project. The theme of the present conference, which follows a little more than a month upon the UNESCO Conference launching UNISIST, comes within one of the core aspects of the project itself — an aspect which is of determining value for the success of the entire programme: that of the formation and education of specialists and users of information. This very timely Roman gathering of world experts and practitioners in the field would, Minister Ripamonti hoped, through their in-depth discussions and appraisal make a major contribution by indicating not only to the scientific community, but also to public opinion and politicians, the road to follow for the solution of these priority problems of such relevant political, economic and social importance.

The Conference work was divided into the two sessions in which the papers are presented in the present volume: 1. *Training of Information Specialists* and 2. *Training of Information users.*

SESSION I

Monday, 15th November 1971: *Chairman*: Prof. A. Caracciolo di Forino. *Rapporteur*: Dr. D. J. Foskett.

Tuesday, 16th November 1971: *Chairman*: Dr. A. Wysocki. *Rapporteurs*: Dr. V. Slamecka and Mrs. L. Vilentchuk.

The work of Session I was appropriately opened by Dr. *A. Wysocki*, Head of the Division of Scientific Documentation and Information of UNESCO in charge of the UNISIST project, who introduced his paper and informed the delegates that at the conference two new major projects were proposed: the establishment of an international centre for training personnel and the constitution of a fellowships pool, available for lecturers and users. A further important decision was taken to extend the scope of the UNISIST system to cover agriculture, medicine, the social sciences and humanities which, in effect, means all the fields of human activity. The final Report had now been submitted to UNESCO's Director General for elaboration in the Budget to be put before the next General Conference.

Dr. *Wysocki* was followed by Mr. *van der Brugghen*, Acting Secretary General of FID, who presented the paper on « Educational Issues in the FID Programme » by Dr. *F. A. Sviridov*, the former Secretary General of FID who had resigned in October. Mr. *van der Brugghen*, in particular, drew attention to some current FID projects undertaken with the support of UNESCO including a manpower study in documentation and library services, a survey of major training trends and the establishment at the Hague of an International Academy for Documentation and Information Science to train teachers particularly from the developing countries. Future plans include regional seminars in developing countries, the professional recognition of documentalists and the harmonization of curricula and degrees in different countries. The speaker also stressed the importance given by FID to training tools, particularly the publication of text books and training courses.

Mr. *W. Piròg*, the Director of the Polish Institute for Scientific, Technical and Economic Information, FID Councillor and Chairman of the FID Committee for Education and Training, commenting on his paper, outlined the Committee's extensive and ambitious programme for 1971-72, which includes the elaboration of model programmes for the training of different user categories and, in collaboration with other FID Committees, of syllabuses on Computer use in documentation, and the project for FID/ET's participation in the implementation of the UNISIST programme. He pointed out that in course programmes the emphasis ought to be placed on future developments rather than mere descriptions of present practice. Mr. *Piròg* ended by stating that the mittee did not regard its co-operation in the Rome Conference as ending with the meeting itself, but intended to include the conclusions reached here in its future activities and working programmes.

Monday afternoon's work was opened by Prof. Dr. *H. Arntz*, Vice Chairman of FID, who amplified his paper on Government responsibilities in eleven important points upon which so much of the discussion before and after their presentation was centred. Summarized briefly they are: 1. the important contribution to progress made by the establishment in the US early in the century of library schools at university level which met the increasing demands for bibliography and documentary services; 2. information policy in many national plans tends to be restricted to informatics. The information that must be put through the computer process can only be the responsibility of specialists in the areas concerned. Hence the same attention must be given to training scientific documentalists (qualified in certain subject fields and documentary methods) as to computer personnel; 3. the same observation applies to user profiles. It is the specialist (i.e., chemical, medical etc.) documentalist that must provide the specialist in the same field with what he needs. Any programme overlooking this group is doomed to failure; 4. granted that information science has now become the most valuable of human resources, it follows that governments must guarantee the highest possible level of all those dealing with information; 5. since information is now an integral part of science policy whose elaboration is and must be the preserve of governments, the State must produce a high level information policy which again depends on the level of trained personnel; 6. the OECD seminar on government responsibilities for information in industry (1970), in considering the categories of information to be provided (economic, marketing, forecasting etc.), identified training as one the responsibilities directly or indirectly the concern of governments. Adequate public funding is essential in this context; 7. due to the growing complexity of information problems countries are increasingly realizing the need to begin information user training in secondary schools; 8. if teaching is to begin in secondary schools the onus will be on governments to provide the necessary staff. Such teachers will have to be trained in universities and colleges alongside other subject fields and to do this information science and techniques must be give due attention in all high school programmes. 9. Top management and senior civil servants who are responsible for setting up information systems, even if they never practice information themselves, have great responsibilities in this field. This calls for brief appreciation courses covering both computer science and information techniques. Successful courses of this type are being provided in certain countries; 10. it is desirable that the responsibility for training documentalists, librarians, information and computing specialists which now tend to be the task of very varied ministries should, taking into account the different exigencies of various countries, as closely as possible come under the educational and science ministries; 11. in view of the increasingly international nature of information and its systems, governments should bear in mind the need to achieve some degree of harmonization in training courses and standardization or at least co-ordination of national information policies and practices.

The last invited speaker of the day, Dr. *C. van Dijk*, Head of the Library and Scientific Information of the Royal Netherlands Academy of Arts and Sciences and formerly of the Royal Dutch Shell, in reference to the title of his paper (« Managerial Responsibilities in Information Training ») observed that although he had deliberately chosen to speak of responsibility at the level of industrial or business management, nevertheless, he felt that there are no fundamental differences between managements dependent on and responsible for information in industrial firms, government organizations or scientific institutes. In this context he mentioned that especially in the larger industrial concerns, because of their more flexible organizational structure they have been earlier in organizing a flow of information in such a way that decision making on the basis of evaluated information coming from a variety of sources is guaranteed. Here governments still frequently find themselves at a disadvantage because of their traditional hierarchical organizational structure which too often results in comparmentalization and fragmentation of information.

Dr. *van Dijk* went on to stress that management should recognize that information, just like the other elements of a firm, is a business aspect in its own right, for the proper functioning of which competent staff should be recuited and that therefore management must make clearly know its needs for qualified personnel. It should, in return provide good career prospects within the enterprise. He ended by pointing out the distinction between documentalists on the one hand and systems experts on the other. The need for human skills will not be eliminated by the introduction of sophisticated machinery: in particular for analysis and evaluation of information required by management.

The second part of Session I was opened on Tuesday morning (Nov. 16th) by Prof. *Alfonso Caracciolo* of the Italian National Research Council, speaking on the « University Training of Information Specialists ». He said that the purpose of his comment was not to suggest any final answer but provoke discussion on a new discipline, albeit with ancient roots, which has yet to be adequately defined. Referring to the Italian situation in particular, he observed that the rigid structure of the university system was ill adapted for the formulation of the type of education needed in a field for which a much more flexible, much more modular structure, capable of division into levels, was essential. This inevitably presented very grave problems for the new sector with such a large interdisciplinary base.

In general, he distinguished three main areas of training: general professional training in information work, training of discipline oriented experts and training of research oriented informations scientists. In this connexion he suggested that information science can be considered as the intersection of three large areas: library and documentation sciences, computer and telecommunication sciences and management and systems sciences. Information science is not only of a composite nature but is also the basis to all other disciplines and areas of activities. This can be represented in a diagram, showing information science (with its three main constituents) as an independent discipline intersecting all other disciplines.

He ended with a strong plea for quality and above all flexibility as regards changing the educational structure as required in order to keep pace with progress and take accumulated experience into account.

In the afternoon Madame *Françoise Cestac*, Administrative Director of the Union Française des Organismes de Documentation spoke about the exchange of trainees and training problems particularly as regards the developing countries. Summing up she said that differential training should be given so as to avoid transmitting too advanced techniques to mentalities not ready for them and every effort made to avoid a too rigid framework. Whereas first year courses given by UFOD are confined strictly to documentary functions, an effort is made in second year courses to extend study to the problem as a whole. She observed that the principal characteristic of the teaching given by UFOD is that it is based on a pedagogy which is not directive but rather in reference to the problems of associated disciplines.

Prof. *Jadwiga Marchlewska* of the Institute for Scientific, Technical and Economic Information of Warsaw, surveyed the problem of minimum internationally agreed standards in information training. In referring to the « Model Programme of Courses for Scientific Information Workers, of which she is one of the authors, based on the analysis of the curricula of twelve countries, she said that the starting point of these was the thesis that the major goal of modern active information is the transmission of information in the most efficient way, from creator to user, in conformance with the user's needs. This requires knowledge of present and expected future needs in the light of users' fuctions and actual activities. On the basis of these assumptions, Prof. *Marchlewska* went on to divide the activities of scientific workers into three main groups and to outline the mimum curricula for training of these categories.

Finally Dr. *A. Tchakhmakhtchev*, of the All Union Institute for Scientific and Technical Information (VINITI) of the USSR, presented the paper on « Training of Information Scientists in the USSR » by Prof. *A. Mikhailov*, Director of VINITI who was unable to attend, and he himself described two UNIDO/UNESCO courses for developing and South American countries held respectively in 1970 and 1971. « Unless the problem of training in information work is solved, he observed, we can hardly expect to make any progress at all in information work. Consequently one of the main tasks of the conference is to outline the principal directives in the training of information specialists ».

Questions on individual invited papers were followed by the brief introduction of submitted papers by the authors present (*Farradane, Newmark, Munzarova* and *Novakova* (presented by *Munzarova*), *Adderley* (present by *Ellison*), *Morelli, Stajano, Laclemendiere, Lupoi, Bottle, Vejsova, Raben* and *Fortier* (presented by *Fortier*), *Wersig, Cannata, Heaps* and *Heyworth* (presented by *Hayworth*), *Brimelow, Keenan, Onesto, Malan, Veenhuis, Marcel van Dijk, Porello, Pinto, Werngren, Lebowitz, Cruzeiro, Califano Tentori, Fava Messina*). These papers were presented in groups following the invited papers to which they were linked.

The main lines of the discussions that followed, which were very largely participated and wide-ranging, are briefly summarized here. Training policy, methods and courses at various levels came under close scrutiny. There was general consensus for the point made by Prof. *Arntz* that all efforts in this field depend on governments recognizing the importance of information and documentation for their work and accepting full responsibility for the training of the teachers that will be needed if teaching information is to begin, as was urged on all sides, in secondary schools or even earlier. Currently the shortage of teachers in both specialist and user fields was a severely limiting factor for the development of training programmes. Such teachers needed to be trained in colleges or institutions for the training of teachers alongside other subject fields, so that they can begin user training for their pupils at an early age (*Bottle, Farradane, Pietsch, Piròg* and others). The meaning of the training of teachers was raised. Was it a matter of imparting factual knowledge of the subjects or training in teaching techniques, presuming the subject is known? (*Vilentchuk*). In this context Prof. *Ceccato* suggested that perhaps the problem of the teachers of teachers had in part been solved because every teacher is, in fact, the product of many teachers who have imparted their knowledge to him. Opposing Mrs *Vilentchuk's* distinction Mr *Piròg* pointed out that there were two aspects of training teachers: training users in schools and colleges and training teachers for information courses.

On the question of training, Mr. *Farradane* considered that the stage of specialization had not yet been reached, since the foundations of the discipline have not yet been consolidated. He also thought that it was undesirable that the UNISIST programme should envisage separation of theoretical information science and the practical work of information specialists. These were taught together in the UK. Mr *Wysocki* answered that UNISIST did not advocate premature specialization, but recognized a distinction that already existed in educational progammes in different countries. Experimentation of different methods and approaches were advisable for comparative studies.

Miss *Frank* drew attention to two studies now underway at OECD on the training and education of information specialists: a survey on curriculum analysis of US and European courses and a forecast of manpower needs in the information field.

A good many speakers showed concern as regards university training, with the relationships and distinctions between librarianship, documentation, information systems design and computer science, the integration and separation of training in informatics and documentation, the intersection theory, the administration of educational programmes that transgress traditional disciplinary divisions of universities and the need for tailoring the design of programmes to the specific conditions of individual countries and even institutions. It was recognized that traditional discipline-bounded structures are static, failing to respond rapidly and flexibly to the objectives and processes of contemporary science, whereas modern education requires the development of programmatic and administrative mechanisms which are adaptable to the dynamic, multifaceted structure of science and knowledge in general (*Wersig, Laclemendiere, Cya, Couture de Troismonts, Porello Farradane, Caracciolo, Ellison,* intervening).

The importance of the close links between teaching and research and of research and development of information systems was underscored, and an extended discussion on the role of informatics developed. (Informatics being understood in the generally accepted West European use of the term). Informatics is part of information science and should be integrated into training curricula. The same attention should be given to scientific documentalists as to computer specialists and the same holds good as regards user profiles. Computers can never replace man, they are a highly valuable tool and should be used for what they were made for and human staff used for specifically human tasks. (*Arntz, Pietsch, Farradane, Jackson, Ellison* and others).

Attention was given to the personal characteristics of students, and there was some support for the view that they should be selected for documentation and information work in relation to their psychological and mental approach to the work. More consideration needed to be given to personal qualities such as versatility, initiative and spirit of service in the selection of students and a training system devized to bring out and develop quality and perspective (*Farradane, Vilentchuk, van der Brugghen, Mazzuchelli, Fava Messina*).

On the specific question of training courses and exchanges for developing countries in relation to Madame Cestac's paper, speakers referred to the importance of the psychological aspects of training programmes, particularly as regards the human relations and communication between hosts and the trainees, the inadequacy of the information generally supplied on the trainee's special interests and economic, social and political background and the necessity for further continuing contact with the trainees after their return to their own country and, if necessary, technical assistance, (*Keenan, Paulo*). In reply to the Turkish delegate, Mrs *Taner*, it was stated by Prof. *Arntz* that that the FID programme, like the UNSIST recommendations, envisaged regional courses for groups of countries where a single training language can be used. In this way the most effective work has already been done in South America. On this basis it is possible to find lecturers acquainted with the working languages and documentary problems and, above all, physically and mentally prepared to go to developing countries and teach there. It was FID policy that basic training be given in the pupils' own country.

The vexed question of terminology was well ventilated and it was urged that two major projects by ISO and UNESCO now underway on the standardization of information terminology should be co-ordinated and made public as quickly as possible. Even at the present Conference the absence of clear definitions on occasions resulted in lack of clarity.

Session II.

Thursday 18th November 1971: *Chairman*: Prof. H. Arntz. *Rapporteurs*: Mr. W. Piròg and prof. A. Caracciolo.

Professor Victor Slamecka, Director of the School of Information and Computer Science at the Georgia Institute of Technology, opening the last day's work, made three main points regarding the implications of training scientific users from the aspect of science today: first the growing evidence of the existence of behavioural laws in science, one of which is the tendency to form small scientific elites responsible for much of the activity in science and for impact on its further development. These elites communicate within and among themselves but rarely outside. The broad mass of non-publishing scientists rarely communicate among themselves but need to communicate quite heavily with the elites. Consequently in the training of information users, the serious communications problem thus created has to be recognized and solved. In his second point Prof. *Slamecka* considers user training in the light of the change that is seen to be occuring from discipline-oriented science to problem-solving science. In his view, at present information services do not have the capacity for solving these multidisciplinary problems. Large libraries of scientific procedures (generally called computer programmes) are now being built up. Thus it appears of greatest importance that, in user training, students of science and engineering recognize the existence of these and are given the tools for accessing them. Thirdly he pointed out the current great imbalance between the vast number of problems and the very limited problem-solving resources of science, necessitating the augmentation of human problem-solving processes by machines and automation. This will probably lead to very large and complex-problem solving systems to assist the human problems-solvers — indeed there are signs that these are already being built. Therefore it is essential to take a long-term view of training users and to broaden our concept of information to include both the extremely important procedures and the statement of these in algorithmic form — and also training in the use of present and future information processing devices with which the scientists of the future will be working.

Dr. *Görgy Rozsa*, the Head of the United Nations Library, Geneva illustrating his paper on the "Information Needs of the Social Sciences" ended with a comment on the terminology of science and the scientific character of information work. At this conference, as elsewhere, he said, library science, information science, communications science, computer science, systems science and so on were frequently mentioned. In his view it is possible to distinguish different levels of scientific activity and science but not all scientific activities are sciences. It would seem that most of the subjects that have been mentioned during the conference are situated at the level of scientific activity, at the level of research but are not, in the strict sense, sciences. Of course science has a double meaning; it means an activity and an organized process of research and it also means the results of this process, a certain knowledge, action and discovery. But the most important product of the communications science, the library science and the information science is information and not a new product, not a new study or discovery. But even if information work is not called a science it is not inferior to scientific activities. Surgery, for instance, is a very important profession but it is not a science, it is a scientific-based activity. Therefore, concluded Dr Rozsa, there seems to be every reason to recommend a restrictive use of the term science in relation to information activity and a major self-control and even self-discipline.

Mr *Kjeld Klintoe,* Director of the Danish Information and Technical Service considering user profiles in industry, said that training the information user in industry must depend more upon an understanding of the concept of the industrial enterprise, of the innovation and communication processes and of the evaluation for decision making, than on information and documentation systems. Conceptual thinking, or, in other words, business analysis trains staff members in the identification of the need for information, it provides training for the definition of problems, for posing the right problems and evaluating information and not documents. Many investigations have shown that innovations are very seldom the result of documentation — documentation plays a rôle of providing background for reliability. In industry it is very important to establish within the company a communication process where a great number staff members are involved with the evaluation of information from the sources. Unless the individual is involved with the evaluation himself, the attitude of « not wanted here » will be developed instead of developing a hunger for information.

In the afternoon Dr. *D.J. Foskett,* Librarian of the Institute of Education of London University tackled the theme of « User Psychology ». In illustrating his paper he underlined the value of psychology for a deeper understanding of the learning processes and the nature of concept formation. All modern work on concept formation emphasizes the value of the intellectual pattern that is formed in the mind of the user. For this reason, he said, in his paper he had chosen to use the personality, matter, energy pattern. The tensions arising in the paradigm or commonly accepted pattern and the multiplication of tensions, that is, the research results which are not satisfactorily explained by the existing paradigm or accepted pattern thinking must be explained only by the creative scientist, and it is we who tell him what the paradigm is so that he knows when he is departing from it. This is a sort of problem solving; namely, the identification of failures to explain the phenomena by the paradigm. This sort of phenomena is common to all fields and hence it is in all fields that we find the need to establish a structure of concepts within the mind of the user — a structure that makes sense to him. Workers in the humanities and the social sciences have just as much need for information services as the natural sciences and technology. The information process must not be devalued to a simple search for reduction, but rather tend to stimulate the human mind to project ideal structures on the future. The ultimate goal of human endeavour is not merely the change of information into knowledge but rather the change of knowledge into wisdom.

On the subject of « First Steps in Users' Training », Mrs *Lydia Vilentchuk,* Director of the Division of Training and Publications of the Israel Centre for Scientific and Technological Information, said that very little had been achieved in the field of professional training in information work. She considered that the training of information workers is still very haphazard and has not produced the standards of knowledge expected from a trained worker in information on various levels. As a consequence the curricula vary not only from country to country but even in the same country from Institute to Institute. This can in part be explained by the fact that students have not received the preliminary and elementary knowledge of the use of information and have had to embark blindly. They are unfamiliar with even the most elementary tools of information retrieval. So when a student starts out in the information or any other field he has to begin first of all to acquire the habits and the tools of intellectual work which very unfortunately his school curriculum has not imparted. And the amount of knowledge to be imparted at university level in all disciplines is growing. Thus she urged that training in information use should begin as early as primary schools.

Prof. *A.I. Mikhailov's* « Training of Information Users », the last invited paper of the Conference, presented by Dr. *A.C. Tchakmakhtchev,* describes the nature of the courses given to information users in the USSR and discusses the reason why correct and timely training of information users is essential for the further progress of science and technology.

Following the same criteria for Session I, submitted papers in Session II were presented briefly by the authors present (*Jackson, Menou, Renaud, Wiesenberger, Arciprete, Cya* and *Ceccato*).

The ensuing general discussion also touched on some of the points raised in Session I, this time from the aspect of users' training. On curricula, methods and requirements for user training, referring to Prof. *Slamecka's* and Mr *Klintoe's* papers, Mr *Farradane* said he would like to bring training down to a practical level. There were two types of users to train or help: 1. the schoolchild and the university graduate. We should teach the child to appreciate the value of knowledge and the intelligent use of libraries. At a university a minimum of 4-6 hours per year was necessary for advancing ideas beyond the schoolchild stage. At his university an attempt was being made to establish such training for all students but the problem is to get the faculties to agree to allow even this small amount of time in their curricula; 2. the working scientist and other professional people needing information. The information specialist will be needed for a long time yet (particularly in developing countries). He can talk in the user's own language and help him more effectively because he can understand his problems by direct communication. The user faced with the machine is in a very different situation. He will, unless he is very knowledgeable, be sitting at the console of an instrument he does not understand and provide feedback when he does not know how to change his enquiry when the first results are wrong. Man cannot be replaced by the computer and there could no justification for suggesting that it might be made to think. If we continue to force information into the strait-jacket of the computer, we shall continue to distort it: hence the need for continuing study of the user and his thinking processes so that information systems are in harmony with him, and not acting against him. Prof. *Slamecka* rejoindered that he certainly had not implied that the modes of operation of humans and computers are identical. « Knowledge utilities as described in his paper would play an important rôle in the future augmentation (*not* replacement) of human problem-solving in science and other disciplines ». And in this context he considered the comment and suggestion that much organized attention be given to the study of the formalization of the human problem solving procedures is absolutely right (*Laclemendiere*) Prof. *Slamecka* also accepted Mr *Wersig's* observation in connection with the idea of the invisible college postulated in his paper, that there is a need to study and impart to users techniques for group communication. Much research in the modes of information transfer is also desirable. On information transfer Prof. *Silvio Ceccato* pointed out the difficulty of drawing conclusions concerning the exchange of information due to the recurring shift between objectivity and subjectivity. He suggested the need to find ways to attach labels to the source of information in order to take further steps towards a more objective approach. Support was forthcoming for the point made by Dr. *Zefferino Ferreira Paulo* that the extension of formal education by continuing education was an absolute necessity, that a broad range of approaches to user education is essential and that the selection of educational mechanisms in particular situations (institutions, countries), should respond to given needs and characteristics in these situations.

Dr. *Wysocki* said that it seemed to him that humanity's main existing resources were: 1. natural resources, 2. knowledge resources and 3. human resources. Since natural resources tended to decrease and knowledge resources to increase, it would seem necessary for human talent to be directed more and more to exploring the scientific information knowledge resources. Therefore he fully endorsed Prof. *Slamecka's* view concerning the necessity for user training. Other points made were that there was a marked difference in the attitude of scientists at different levels concerning printed sources and indexing services and special courses were required for such services (*Harvard*

Williams), instruction tended to be more acceptable to the user when given by someone within his own background and preferably same peer group (*Bottle*) and courses for information users would always be necessary until information use is included in general education curricula (*Wiesenberger*). Mr *C. van Dijk* considered that the gap existing between information services and potential users (the scientists and research workers), which we attempt to bridge by training the users and the information intermediaries, should not exist. He felt much could be done to close this gap if a too much neglected recommendation of the Weinberg Report was followed up: that in every small group of scientific workers — a team working on a project or a study — one or two people should form part of the team as information specialists and should come from the team people and not the other side of the gap.

As regards user profiles Dr. *Wiesenberger* said that in order to have a proper approach to different kinds of information users and to try and carry out their differentiated education it was essential to ascertain their various profiles which could be divided into two parts: 1. their requirements and range of interests and 2. their various qualities, faculties and capabilities and especially the psychological aspects.

A fairly extensive discussion developed on Dr. *Foskett's* paper on User Psychology. Mr. *Marloth* though that users should have a good image of an information centre as a really helpful thing, that users should have the feeling that information is really necessary for them in their job and find the required information in the right packages. In many cases psychological barriers prevent the right use of information and psychology has to find the reason why.

Another delegate (Mr. *M. van Dyke*), speaking on the subject of the training of information users in firms, said that it often happened that once this had been successful and « middle management » had learned that « knowledge is power », they react by trying to make this knowledge their own private preserve, only allowing the most useless part to pass down to lower levels. Only effective psychological action can overcome this tendency.

Mr. *Wersig* considered user psychology could not neglect the whole area of social psychology and socially-oriented research, or the whole range of aspects of the psychology of perception, especially social perception and misperception, association psychology, the psychology of reference groups and psycho-linguistics etc. Relevant research ought be started right away. In this connexion Mr. *Foskett* pointed out that he had made it clear at the beginning of his paper that as yet very little research had been undertaken on the psychology of users of libraries and information services.

Miss *Keenan* and Mme *Cestac* ended the general discussion, pointing out the opportuneness of using in teaching the results of the work done by the working groups on standards, in particular those being prepared by ISO.

A detailed debate followed on the set of conclusions embodying the main findings of the conference. The draft document was submitted to the delegates by the Session Chairman Prof. *Arntz* and Dr. *Foskett,* kindly acting as the general rapporteur for this purpose. The document was approved with minor amendments by the vast majority of the participants and the drafting committee was asked to edit the final document, taking into account the emendments agreed during the discussion. The conclusions would be circulated to all the appropriate international and national organizations.

The Hon. *G. Zonca,* Under-Secretary of State for Scientific and Technical Research attended part of the discussion on the conclusions. Before leaving, he addressed the delegates briefly, stating, in the name of the Italian Government, his appreciation of the work that had been done.

Earlier in the afternoon the Hon. *Mario Zagari,* prevented by a cabinet meeting from being present until the end of conference work, gave his closing address (printed on p. 468). In his reply the Chairman for the day, Prof. Dr. *Arntz* thanked the Minister for presiding over the conference and coming there inspite of the pressing burden of daily offical work and addressing the delegates twice in a way which was absolutely on-line with the subject of the conference and with words that they will not forget in their future work.

Brief addresses of thanks and farewell from Prof. Dr. *Helmut Arntz* (p. 473) and Dr. *Firrao,* Chairman of the Organizing Committee (p. 475) finally brought the work of the Rome Conference to a close.

During the Conference, three meetings were held:

— A Working Group on University Training, presided over by Dr. *J. Farradane;*

— Working Group I of the FID/ET Committee, under the Chairmanship of Dr. *Pietsch,* for the examination of problems concerning the training of information users (19th November).

— FID/ET Committee, with Mr. *Piròg* in the Chair, to discuss training programmes (20th November).

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AGRIS	International Information System for Agricultural Science
AIB	Associazione Italiana Biblioteche
AICA	Associazione Italiana per il Calcolo Automaico
AICA	Association Internationale pour le Calcul Anologique
AIDI	Associazione Italiana per la Documentazione e l'Informazione
ANRT	Association Nationale de la Recerche Technique (France)
ASIS	American Society for Information Science
ASLIB	Association of Special Libraries and Information Bureaux (UK)
BIT	Bureau International du Travail
CIINTE	See IINTE
CIOS	Comité International de l'Organisation Scientifique
CNIPE	Centre National d'Information pour la Productivité des Entreprises (France)
CNR	Consiglio Nazionale delle Ricerche (Italy)
COMECON	Council for Mutual Economic Assistance
CSAO	Centro Studi e Applicazioni d'Organizzazione (Italy)
DGD	Deutschen Gesellshaft für Dokumentation (Federal Germany)
EEC	European Economic Community
FAO	Food and Agricultural Organization (UN)
FID	International Federation for Documentation
IBI-ICC	Intergovernmental Bureau for Informatics - International Computing Centre
ICSU	International Council of Scientific Unions
IFAC	International Federation for Documentation
IFIP	International Federation for Information Processing
IFIS	International Food Information Service
IFLA	International Federation of Library Associations
IFORS	International Federation of Operations Research Scientists
IINTE	Institute for Scientific, Technical and Economic Information (Poland, Formerly CIINTE)
IMEKO	International Management Federation
INAPI	Ente Nazionale per l'Artigianato e le Piccole Industrie (Italy)
INI	Istituto Nazionale dell'Informazione (Italy)
INIP	Istituto Nazionale per l'Incremento della Produttività (Italy)
INIS	International Nuclear Information System
INSEE	Institut National de la Statistique e des Etudes Economique (France)
INTD	Institut National des Techniques de la Documentation (France)
ISLIC	Israel Society of Special Libraries and Information Centres
ISO	International Standards Organization

MIT	Massachussets Institute of Technology (USA)
NCC	National Computing Centre (UK)
OECD	Organization for Economic Cooperation and Development
SINDFOK	Swedish Council for Information and Documentation
UFOD	Union Français des Organismes de Documentation
UNDP	United Nations Development Plan
UNESCO	United Nations Education, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNISIST	World Science Information System
UNO	United Nations Organization
VINITI	All Union Institute for Scientific and Technical Information (USSR)
WHO	World Health Organization.

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